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***Frontier Hard Chrome  
Event 9 Long-Term Monitoring Report  
(December 2006 Results)***

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***Department of Ecology Contract: C0500198***

***January 2007***



***Weston Solutions, Inc. • 190 Queen Anne Avenue North • Seattle, WA 98109-4926***

**FRONTIER HARD CHROME  
LONG-TERM MONITORING REPORT  
EVENT 9—DECEMBER 2006  
VANCOUVER, WASHINGTON**

*Prepared for*

**Washington State Department of Ecology  
PO Box 47600  
Olympia, Washington 98504**

Contract No. C0500198

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*Prepared by*

Weston Solutions, Inc.  
190 Queen Anne Avenue North  
Suite 200  
Seattle, WA 98109

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Prepared  
and  
Approved By:

original signed  
Larry Vanselow, P.E.  
Project Manager

Date: 1-29-07

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## **SECTION 1**

### **INTRODUCTION AND BACKGROUND**

#### **1.1 INTRODUCTION**

This Long Term Monitoring Report has been prepared under Contract C0500198 to the State of Washington Department of Ecology (Ecology) for Long Term Monitoring of the Frontier Hard Chrome (FHC) site located in Vancouver Washington.

This report describes the sampling activities performed and analytical results obtained during “Event 9” of the long-term groundwater monitoring program at FHC. Sampling activities for Event 9 were conducted during December 2006.

The FHC site was the subject of a remedial action conducted during the summer of 2003. The purpose of the remedial action (RA) was to treat the site’s chromium-contaminated soil and groundwater to cleanup levels specified in the Record of Decision. Long term monitoring is required to track offsite plume concentrations as well as show that the remedy is maintaining its operational functionality.

The first 3 groundwater monitoring events (Events 1 through 3) were conducted for the United States Environmental Protection Agency (EPA). In October 2004, responsibility for this site was turned over to Ecology. Ecology contracted Weston Solutions, Inc. (Weston) to perform the next 2 rounds of monitoring (Events 4 and 5) as a result of Weston’s familiarity with this site and the associated property owners. Ecology amended Weston’s contract in February 2006 to perform 6 additional rounds of quarterly monitoring with the last to be completed in June 2007.

All Event 9 work was performed in accordance with project work plan titled *Frontier Hard Chrome, Long Term Monitoring Plan* (Weston 2004).

#### **1.2 BACKGROUND AND PROBLEM DEFINITION**

##### **1.2.1 Site Background**

The FHC site is located in southeastern Vancouver, Washington (Figure 1). The facility address is 113 “Y” Street, Vancouver, Washington. The site is located in the Section 25, Township 2 north, Range 1 east, Willamette Meridian in Clark County, Washington. The location in latitude and longitude coordinates is 45 degrees, 37 minutes, 19 seconds north by 122 degrees, 38 minutes 45 seconds east (Degrees, Minutes, Seconds [DMS]). The site was previously occupied by several metals fabricating businesses and was used for storage and as a staging area for a neighboring business. Currently, no buildings exist on the site and the site is vacant. A truck driving school is operating on the parcel south of the site.

The FHC site proper covers approximately 0.5 acres and is bordered to the east by Grand Avenue, to the south by Test-U, and to the west by “Y” Street.

Work began on the remedial design in October 2001. The remedial design was completed in February 2003. The remedial action, consisting of building demolition, treatment of source area soil and groundwater, and installation of an in-situ redox manipulation (ISRM) treatment wall (to treat hexavalent chromium), was completed in September 2003.

### **1.2.2 Problem Definition**

The goal of the remedial action was to treat source area soil and groundwater to reduce hexavalent chromium concentrations such that groundwater downgradient of the site would attenuate to chromium concentrations less than 50 micrograms per liter (ug/L). To demonstrate this, groundwater quality was monitored in two areas. The first area consisted of locations immediately within and down gradient of the ISRM wall. Wells located within and just down gradient of the wall were monitored to ensure the continued operational functionality of the ISRM Treatment Wall. The second area monitored consisted of the historical chromium contaminated groundwater plume located down gradient of the ISRM wall. This down gradient plume did not receive treatment during the remedial action and was monitored to track the long-term expected reduction in chromium concentration as a result of completing the remedial action and elimination of the source of hexavalent chromium.

Long-term groundwater monitoring is required by the site’s Record of Decision.

## **1.3 MONITORING SCHEDULE**

Sampling events performed for EPA were conducted approximately quarterly for the first year after completion of the remedial action. Planned sampling events were completed in February, April, and August 2004. The sampling event performed the week of 16 August 2004 concluded monitoring for approximately one year after the remedial action was completed.

In September/October 2004, monitoring of the FHC site was turned over to the Washington State Department of Ecology. Sampling of the site groundwater for Ecology occurred in May 2005 and again in December 2005. In February 2006, Ecology amended Weston’s contract to perform 6 additional rounds of monitoring to be done quarterly: March 2006, June 2006, September 2006, December 2006, March 2007 and June 2007.

## SECTION 2

### SAMPLING ACTIVITIES AND RESULTS

#### 2.1 MONITORING WELL SAMPLING PROCEDURES

Sampling activities for Event 9 were conducted on December 2<sup>nd</sup> through December 6<sup>th</sup>, 2006 by Weston Solutions, Inc, (Weston).

The monitoring wells in the vicinity of the FHC site are shown on Figure 2. A total of 33 wells in the vicinity of the site were sampled for metals in accordance with the *Long Term Monitoring Plan* (Weston 2004).

Well purging and sampling were performed according to sampling guidelines and Weston standard operating procedures. The wells were sampled with a peristaltic pump equipped with new polyethylene tubing deployed to mid-screen depth at each well. The wells were purged prior to sampling until monitored field parameters (turbidity, conductivity, pH, dissolved oxygen, ORP, and temperature) stabilized. The field parameter readings were recorded on field sampling forms.

Groundwater samples were analyzed for total analyte list (TAL) metals. In cases where groundwater turbidity was greater than 10 nephelometric turbidity units, samples were passed through a 0.45-micron filter in the field and submitted for dissolved TAL metals. Only one well (RA-MW-12A) had turbidity in excess of 10 NTU during this sampling event. Also during Event 9, both total and dissolved metals analyses were performed on samples collected from RA-MW-15B and RA-MW-16B at Ecology's request.

Selected samples were analyzed for total sulfur and sulfate to provide an assessment of the distribution of byproducts from the reducing agent used during ISRM wall installation.

Groundwater chromium concentrations are provided in Table 1. Measured field parameters are provided in Table 2.

#### 2.2 ANALYTICAL RESULTS

##### 2.2.1 Chromium

Chromium was detected in 5 of the 33 wells sampled. The reduction in the number of wells where chromium was detected compared to previous rounds is due to higher detection limits during this round of sampling. The detection limit for chromium during this round was 5 ug/L whereas in most previous rounds, the detection limit was 0.5 ug/L.

Total detected chromium concentrations in the "A" zone ranged from a maximum concentration of 81 ug/L in well RA-MW-12A to 31 ug/L in well B87-8. All "A" zone wells except RA-MW-



12A and B87-8 had total chromium concentrations less than the detection limit of 5 ug/L. Monitoring well RA-MW-12A (which has generally had the highest concentration of chromium) had a dissolved chromium concentration of 6.8 ug/L. Filtered samples (in addition to unfiltered samples) have been routinely collected from well RA-MW-12A due to its high turbidity.

“A” zone chromium concentrations and plume contours are shown in Figure 3. Filtered sample data was used in preparing Figure 3 where available.

Total detected chromium concentrations in “B” zone groundwater ranged from a maximum of 21 ug/L (well RA-MW-15B) downgradient of the site to 16 ug/L in well RA-MW-16B. With the exception of wells RA-MW-15B and RA-MW-16B, all other “B” zone wells contained total chromium less than 5 ug/L. The filtered samples from wells RA-MW-15B and RA-MW-16B had chromium concentrations of 16 ug/L and 18 ug/L, respectively.

“B” zone chromium concentrations and plume contours are shown in Figure 4. Filtered sample data was used in preparing Figure 4 where available.

Figures showing the chromium concentration trends in groundwater over time are included in Appendix A. Data from wells sampled during Operational and Functional monitoring in November and December 2003 are included in these figures where available to assist in determining trends. Laboratory chromium data sheets for the December 2006 sampling event are provided in Appendix B.

Figures 3, 4, and those in Appendix A used filtered chromium values where available. In this latest December 2006 round of sampling, turbidity exceeded 10 NTU in one well; RA-MW-12A. However, filtered samples were also collected from wells RA-MW-15B, and RA-MW-16B. Filtered samples were collected from wells RA-MW-15B and RA-MW-16B at the request of Ecology to assist in determining the cause of the elevated total chromium concentrations in previous sampling events.

### **2.2.2 Water Quality**

Dissolved oxygen (DO) concentrations ranged from a low of 0 mg/L to a high of 9.37 mg/L (DO values of 73 and 56 mg/L were neglected since they are above saturation levels; the presence of high concentrations of reagents interferes with correct readings of the DO meter). DO averaged 1.04 mg/L in samples collected within the ISRM Treatment Wall. The DO concentrations indicate the wall is still reductive which is necessary for treatment of hexavalent chromium. Samples of groundwater collected downgradient of the ISRM Treatment Wall had higher concentrations of DO which tended to increase with distance from the wall.

pH ranged from 6.2 to 8.1. The highest pH during this round was located in well RA-MW-12B; this pH is not unusual since this well contains high concentrations of reagents.

The highest sulfur and sulfate concentrations were located within the treatment wall. Maximum sulfur and sulfate concentrations in groundwater were 342 mg/L and 1120 mg/L, respectively.

Concentrations of sulfur and sulfate were significantly lower immediately downgradient of the wall.

### **2.3 GROUNDWATER FLOW DIRECTION AND ELEVATION**

Groundwater surface elevations were determined using the known elevation of the top of each well casing and the depth to groundwater measured in each long term monitoring well. The depth to groundwater measurements were collected during the morning of 05 December 2006. The Columbia River elevation at the United State Geological Survey (USGS) gauging station 14144700 located at the nearby I-5 bridge was obtained for use in determining flow direction. The elevation of the river at 1200 hours on 05 December 2006 was 6.76 feet (corrected to NGVD 1929 by adding 1.82 feet to the measured river elevation). The river elevation information can be obtained from <http://waterdata.usgs.gov/wa/nwis/>.

Groundwater surface elevations for each well measured are shown in Table 4. The groundwater flow direction (as determined using groundwater surface elevations measured in each well within a period of 2.0 hours) is heading away from the FHC site. A horizontal gradient was calculated for 05 December 2006 with a result of 0.00005 ft/ft with a flow direction toward the Columbia River. The groundwater table during this period had a drop in elevation of 0.11 feet over a distance of 2,400 feet.

Groundwater elevation and gradient information is graphically shown in Figure 5.

### **2.4 QUALITY ASSURANCE**

Data quality was checked by running field duplicates. Laboratory duplicates and matrix spike analyses were performed by the lab. Table 5 shows the quality control results.

Field duplicates were run on both filtered and unfiltered samples during this sampling event. Filtered duplicate results had good correlation with original sample results (relative percent difference of 6%).

### **2.5 INVESTIGATION-DERIVED WASTES**

Investigation-derived waste (IDW) generated during the sampling event consisted of well purge water, used PPE, and disposable sampling supplies. During sampling, purge water was stored on site in 5-gallon buckets. At the completion of sampling, the water was transported to the City of Vancouver's operations center and disposed of in accordance with the disposal permit issued to Weston by the city. Approximately 75 gallons of water was disposed. Personnel protective equipment and other solid wastes were disposed of in a dumpster.

## 2.6 DISCUSSION AND CONCLUSIONS

Chromium concentrations in onsite “A” zone groundwater in and around the ISRM Treatment Wall were less than 10 ug/L (using dissolved chromium concentrations where available). Chromium concentrations in groundwater between the ISRM Treatment Wall and East 1<sup>st</sup> Street were less than 5 ug/L. Chromium concentrations in well B87-8, located south of East 1<sup>st</sup> Street, were 31 ug/L. Concentrations of chromium in samples collected during this round of sampling were very similar to those collected in September 2006 with the exception of well B87-8 which contained chromium at approximately twice the September concentration. In general, the chromium concentrations in groundwater on and downgradient of the site were relatively uniform during the December 2006 sampling event with almost all chromium concentration less than 5 ug/L.

The deeper “B” zone groundwater downgradient of the site contained chromium in concentrations similar to that in the “A” zone, with the exception of wells RA-MW-15B and RA-MW-16B. Chromium concentrations in “B” zone groundwater on and downgradient of the site were less than 5 ug/L.

Wells RA-MW-15B and RA-MW-16B have had anomalously elevated chromium concentrations in unfiltered samples beginning in May 2005. Small black particulate was also observed in samples collected from these wells in December 2005 and have typically appeared in samples collected since that time. Therefore, both unfiltered and filtered samples were collected from these wells during this sampling event regardless of turbidity. The unfiltered sample from well RA-MW-15B had a chromium concentration of 21 ug/L whereas the filtered sample had a chromium concentration of 16 ug/L. The unfiltered sample from well RA-MW-16B had a chromium concentration of 16 ug/L whereas the filtered sample had a chromium concentration of 18 ug/L. In this round of sampling, both the total and dissolved chromium concentration in wells RA-MW-15B and RA-MW-16B were similar.

Well RA-MW-16A located downgradient of the treatment wall had evidence that reagents had reached this well. This well had a faint sulfur smell.

Dissolved oxygen data collected from within the ISRM Treatment Wall indicates that an area of reducing conditions still exists implying the hexavalent chromium treatment zone is still active. Most locations within the treatment wall contain dissolved oxygen at concentrations less than 3.0 mg/L and negative oxygen reduction potential (ORP) implying reducing conditions are present.

Sulfur/sulfate concentrations within the ISRM Treatment Wall have fluctuated while sulfur/sulfate concentrations downgradient of the ISRM Treatment Wall have generally increased since February 2004. Sulfur/sulfate concentrations in well B87-8 and B85-4 located across East 1<sup>st</sup> Street (downgradient of the site) have increased by a factor of approximately 2 to 4 since February 2004. Sulfur and sulfate concentrations were less than 120 mg/L and 250 mg/L in most locations sampled during December.

## SECTION 3

### ANALYTICAL METHODS AND DATA VALIDATION

#### 3.1 ANALYTICAL METHODS REQUIREMENTS AND DATA VALIDATION

The laboratory data quality assurance review and validation of analytical results for 38 water samples has been completed. Samples were collected between 02 December 2006 and 05 December 2006 from the Frontier Hard Chrome site and were analyzed for dissolved and total recoverable chromium.

The quality assurance review was performed on the laboratory data sheets and the WDOE memorandum to ensure that the analytical results met data quality objectives for the project. All laboratory quality assurance results as applicable (e.g., holding times, blank sample analysis, matrix spike/duplicate analysis, laboratory control sample analysis) supplied to Weston for the analyses met acceptance criteria specified in the work plan (Weston 2004), with no exceptions noted.

Samples **RA-MW-15B** and **RA-MW-16B** were collected both as total recoverable (unfiltered) and dissolved (field-filtered) fractions – with one fraction submitted for total recoverable chromium analysis and the other filtered at the time of collection and submitted for dissolved chromium analysis. Samples **B87-8** and **RA-MW-15B** were collected as a field duplicates for total recoverable and dissolved chromium analysis, respectively.

Data validation documentation is provided in Appendix C.

## **SECTION 4**

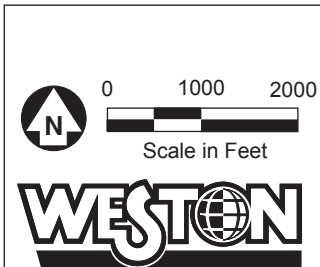
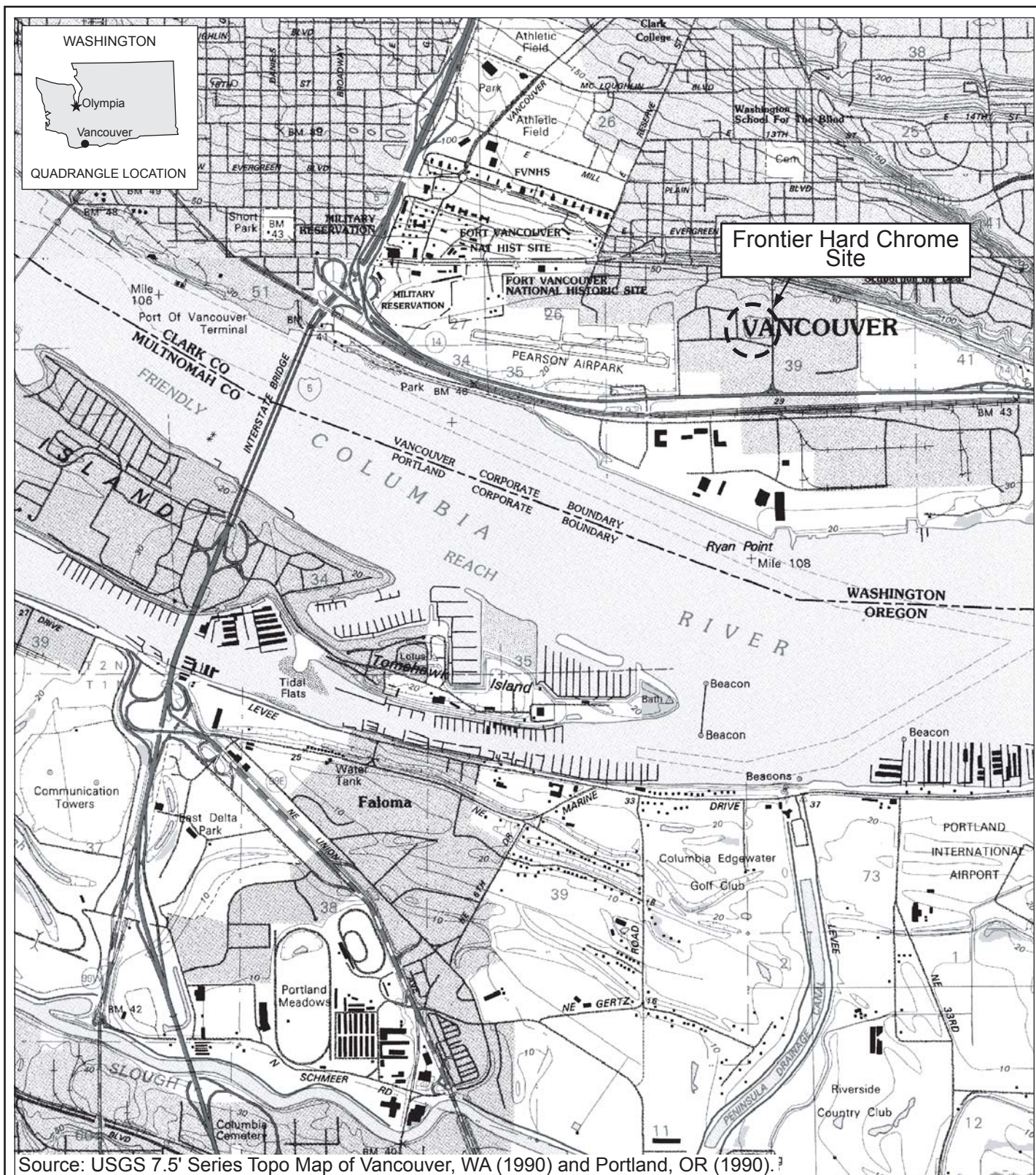
### **REFERENCES**

EPA (United States Environmental Protection Agency), 2003. Statement of Work for Long Term Response Action. Frontier Hard Chrome, Vancouver, WA. December 30<sup>th</sup>, 2003.

Weston (Weston Solutions, Inc.), 2004. Frontier Hard Chrome Long Term Monitoring Plan. Prepared for the U.S. Environmental Protection Agency, Region 10, Seattle, Washington. February.

## FIGURES



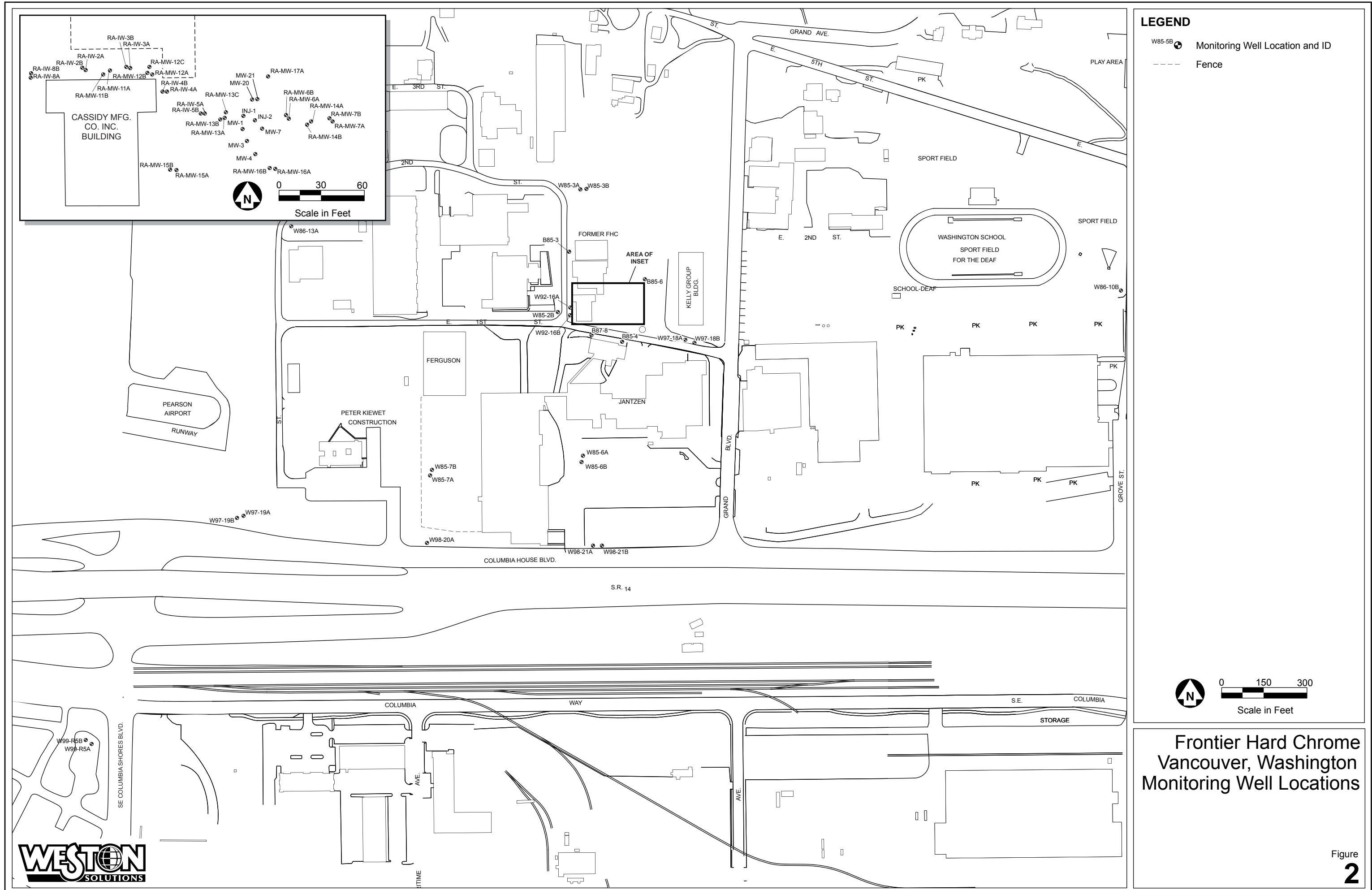


# Frontier Hard Chrome Vancouver, Washington Vicinity Map

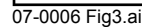
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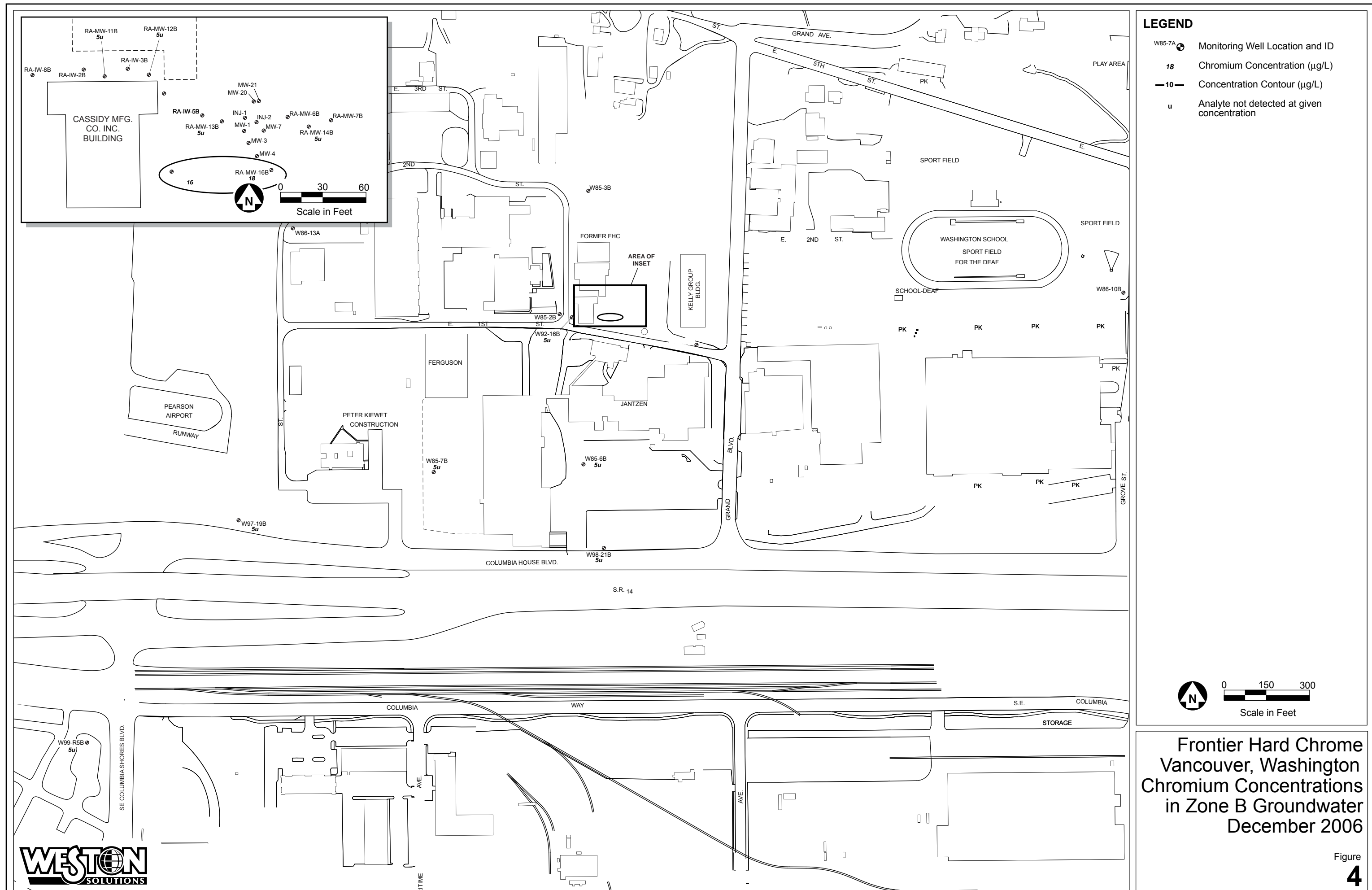
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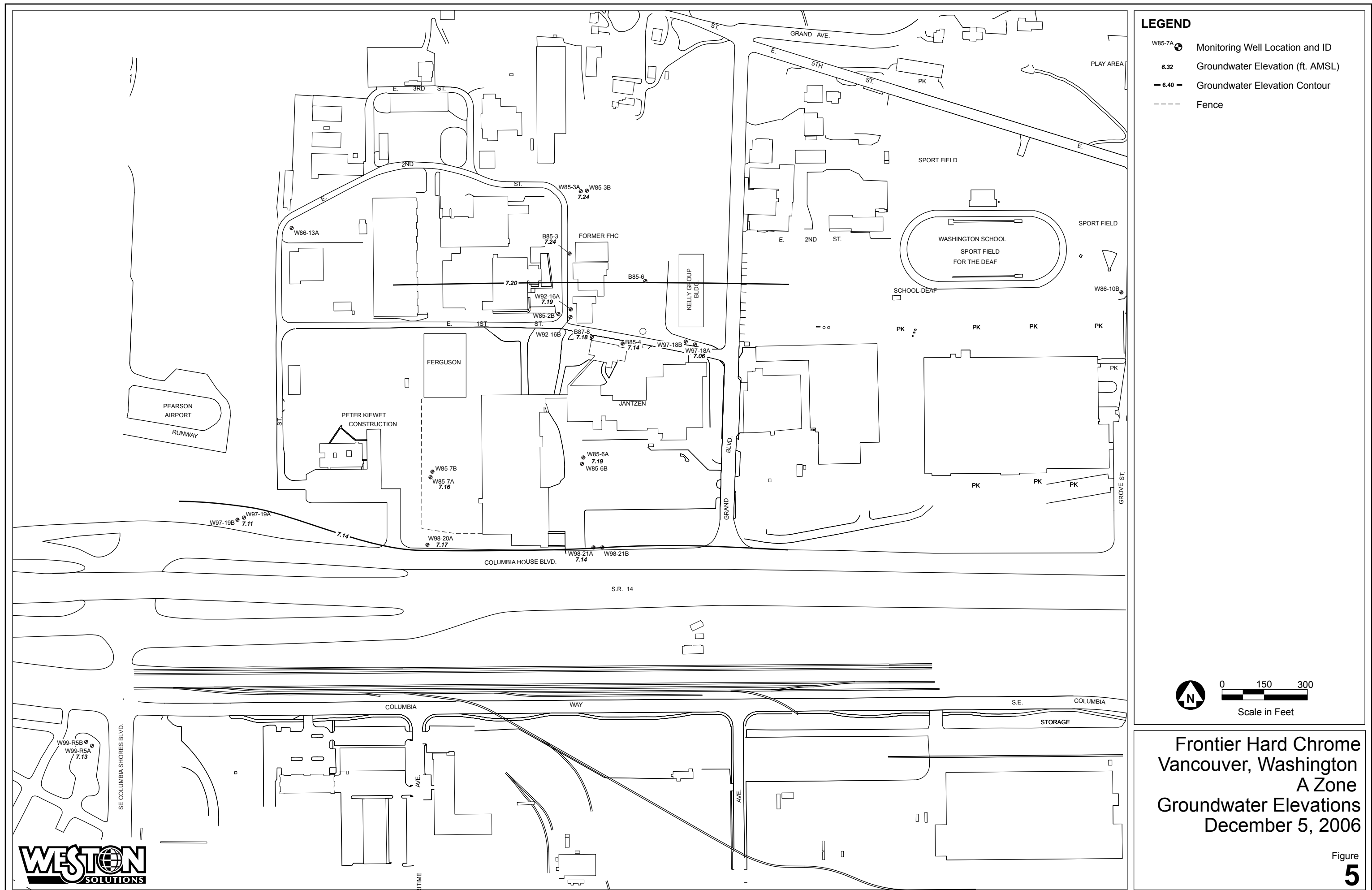












## TABLES

**Table 1—Frontier Hard Chrome—Event 9 Chromium Results**

Well Number	Concentration (ug/L)		Sample Observations
	Total	Dissolved	
RA-MW-12A	81	6.8	Purge water initially black, then turned yellow-green as more water purged. Strong sulfur smell. Unfiltered sample was cloudy.
RA-MW-12B	5U	--	Light yellow-green color, sulfur smell. Color mostly disappears after purging. As sample sits, it turns cloudy, NTU increases.
RA-MW-12C	5.1	--	Clear, faint sulfur odor.
RA-MW-11A	5U	--	Clear, strong sulfur smell.
RA-MW-11B	5U	--	Clear, strong sulfur smell.
RA-MW-13A	5U	--	Clear, faint sulfur odor.
RA-MW-13B	5U	--	Clear, faint sulfur odor.
RA-MW-13C	5U	--	
RA-MW-17A	5U	--	
RA-MW-14A	5U	--	Clear, faint sulfur odor at start of purging.
RA-MW-14B	5U	--	Clear, faint sulfur odor.
RA-MW-16A	5U	--	Clear, faint sulfur odor.
RA-MW-16B	16	18	Clear, faint sulfur odor.
RA-MW-15A	5U	--	
RA-MW-15B	21	16	Small white particulate in sample.
B87-8	31	--	Small black particulate in sample.
B85-3	5U	--	
W92-16A	5U	--	
W92-16B	5U	--	
B85-4	5U	--	
W97-18A	5U	--	
W97-18B	5U	--	
W85-7A	5U	--	
W85-7B	5U	--	
W97-19A	5U	--	
W97-19B	5U	--	
W98-20A	5U	--	
W99-R5A	5U	--	
W99-R5B	5U	--	
W98-21A	5U	--	
W98-21B	5U	--	
W85-6A	5U	--	
W85-6B	5U	--	

-- denotes no sample collected

U: denotes analyte was not detected

J: denotes estimate.

**Table 2—Frontier Hard Chrome—Event 9 Monitoring Field Parameters<sup>1</sup>**

<b>Well Number</b>	<b>Temp C</b>	<b>Spec. Cond. (mS/cm)</b>	<b>DO (mg/L)</b>	<b>pH</b>	<b>ORP (mV)</b>	<b>Sulfur<sup>2</sup> (mg/L)</b>	<b>Sulfate<sup>2</sup> (mg/L)</b>	<b>Turbidity (NTU)</b>
RA-MW-12A	13.9	2.95	56.41*	7.59	-373			12
RA-MW-12B	13.4	2.12	73.22*	8.06	-374			2
RA-MW-12C	13.1	1.05	3.33	7.74	-217			3
RA-MW-11A	13.7	2.21	1.8	6.43	-671	342	1120	1
RA-MW-11B	13.4	1.50	2.5	6.86	-303			0.5
RA-MW-13A	12.8	2.33	0	7.02	-121	207	657	0.3
RA-MW-13B	13.0	2.22	0	7.04	-125			0.5
RA-MW-13C	12.4	1.36	0	7.45	-137			8
RA-MW-17A	13.4	1.30	0.35	6.66	-34			0.8
RA-MW-14A	12.7	0.77	1.75	6.76	-64	72	225	0.1
RA-MW-14B	12.8	0.89	1.73	6.98	-144			0.2
RA-MW-16A	13.8	1.13	0.31	6.68	-125			0.1
RA-MW-16B	13.4	1.34	0.21	6.62	-113			0.2
RA-MW-15A	14.7	1.74	0.29	6.53	-24			2
RA-MW-15B	14.1	1.60	0.30	6.39	32			7
B87-8	13.8	0.44	0.25	6.71	167	31	98	0.1
B85-3	12.4	0.97	0.80	6.73	-59			7
W92-16A	13.6	0.47	0.33	6.59	127			0.1
W92-16B	13.1	0.61	0.23	7.46	113			1
B85-4	13.8	0.92	0.30	6.47	161	67	212	0
W97-18A	13.0	0.16	0.90	6.29	192			1
W97-18B	12.6	0.28	4.59	6.55	187			0.2
W85-7A	13.4	0.13	2.39	6.45	131	3	7	0.8
W85-7B	13.0	0.03	0.06	6.57	141			0.3
W97-19A	13.9	0.26	9.37	6.55	96			1
W97-19B	13.0	0.28	4.13	6.83	88			1
W98-20A	14.0	0.25	9.14	6.26	143			0.3
W99-R5A	13.9	0.27	6.26	6.40	131	5	14	1
W99-R5B	13.5	0.28	4.90	6.62	122			1
W98-21A	13.7	0.29	4.97	6.16	157			0.1
W98-21B	13.4	0.32	4.90	6.38	148			0.2
W85-6A	13.9	0.24	2.63	6.63	123	7	21	2
W85-6B	13.1	0.17	5.15	8.05	70			9

<sup>1</sup>Parameters measured after readings stabilized.

<sup>2</sup>Sulfur and sulfate data obtained from laboratory analyses.

\*: Denotes sulfur interference with dissolved oxygen readings.

Table 3—Comparison of Conventional Parameters

Well #	Temp (C)									Conductivity (mS/cm)								
	Feb-04	Apr-04	Aug-04	May-05	Dec-05	Mar-06	Jun-06	Sep-06	Dec-06	Feb-04	Apr-04	Aug-04	May-05	Dec-05	Mar-06	Jun-06	Sep-06	Dec-06
RA-MW-12A	14.9	15.9	17.9	15.2	14.9	14.6	14.3	14.9	13.9	6.01	5.4	4	3.32	2.52	2.47	2.37	2.26	2.95
RA-MW-12B	14.4	16.6	16.7	15.6	14.3	14.9	14.4	14.5	13.4	2.25	1.19	1.52	2.56	2.47	1.34	1.39	1.19	2.12
RA-MW-12C	14.4	16.5	16.6	15.1	14.2	14.3	14.2	14.2	13.1	2.18	1.34	1.13	0.68	1.09	0.69	0.88	0.53	1.05
RA-MW-11A	15.7	16.5	17.4	15.7	15.0	15.1	15.1	14.9	13.7	1.67	1.89	2.02	1.48	1.82	2.01	1.46	1.7	2.21
RA-MW-11B	14.9	16.3	17	15.6	14.9	14.7	14.7	14.7	13.4	1.49	2.08	2.02	1.72	2.25	1.17	0.94	1.1	1.50
RA-MW-13A	15	14.6	15.73	14.9	14.5	14.3	13.7	14.1	12.8	5.21	2.42	3.29	2.83	2.49	2.17	1.66	1.13	2.33
RA-MW-13B	14.8	14.7	15.4	14.9	14.2	14.3	14.1	14.2	13.0	3.73	1.38	2.15	2.41	2.16	0.81	0.82	0.5	2.22
RA-MW-13C	14.2	15	14.9	14.5	14.3	13.8	13.8	14.1	12.4	3.07	1.82	1.41	1.28	0.71	0.79	0.82	0.57	1.36
RA-MW-17A	14.3	15.3	16.7	15.1	14.5	13.7	--	13.9	13.4	1.8	1.8	1.8	1.39	1.18	1.3	--	1.18	1.30
RA-MW-14A	13.9	14.3	15.3	14.6	14.7	10.8	--	13.6	12.7	1.43	1.71	1.96	1.08	0.88	0.87	--	0.92	0.77
RA-MW-14B	14	14.9	15.5	14.5	14.1	12.3	--	14.0	12.8	1.56	1.21	0.98	1.08	1	0.78	--	0.69	0.89
RA-MW-16A	14.3	14.9	16	14.9	15.1	13.3	13.4	14.8	13.8	2.95	1.46	2	1.7	1.07	1.04	1.01	0.8	1.13
RA-MW-16B	14.3	14.6	16	14.7	13.9	13.7	13.8	15.2	13.4	2.42	1.19	1.4	1.81	0.92	0.67	0.51	0.43	1.34
RA-MW-15A	14.3	14.5	15	15	14.7	14.8	14.7	15.1	14.7	1.88	1.04	1.08	1.3	1.42	1.53	1.44	1.27	1.74
RA-MW-15B	13.9	14.4	15.4	14.7	14.1	14.0	14.5	17.2	14.1	0.47	0.86	0.68	0.64	0.91	0.92	0.8	0.46	1.60
B87-8	14.5	14.7	15.8	15.2	14.7	14.4	14.5	14.4	13.8	0.26	0.55	0.36	0.29	0.24	0.38	0.27	0.36	0.44
B85-3	14.6	14.8	15.2	15.8	14.4	14.1	13.6	14.6	12.4	0.99	0.90	0.98	0.81	0.54	0.74	0.64	0.72	0.97
W92-16A	14.2	15.6	16.1	15.3	14.0	13.8	14.1	15.5	13.6	0.33	0.25	0.27	0.23	0.24	0.28	0.28	0.37	0.47
W92-16B	14.1	14.7	16.2	15.2	13.7	13.7	13.8	15.4	13.1	1.17	1.37	0.95	0.66	0.09	0.34	0.42	0.32	0.61
B85-4	14.1	14.4	15.1	14.4	13.9	13.5	14.3	14.5	13.8	0.41	1.17	0.51	0.71	0.28	0.74	0.33	0.56	0.92
W97-18A	11.3	11.0	15.0	12.7	13.9	12.0	--	13.8	13.0	0.11	0.09	0.11	0.08	0.1	0.19	--	0.15	0.16
W97-18B	11.4	12.4	14.4	13.5	13.0	10.7	--	13.8	12.6	0.26	0.24	0.27	0.22	0.19	0.19	--	0.19	0.28
W85-7A	11.4	12.6	14.9	13.9	14.5	12.3	13.7	15.9	13.4	0.13	0.14	0.21	0.12	0.11	0.1	0.16	0.16	0.13
W85-7B	12.1	13.0	14.5	13.6	14.1	12.8	13.4	14.4	13.0	0.28	0.31	0.32	0.01	0.01	0.01	0.02	0.01	0.03
W97-19A	12.5	13.3	16	14.3	13.8	12.9	--	15.3	13.9	0.25	0.26	0.28	0.23	0.23	0.19	--	0.21	0.26
W97-19B	12.7	13.3	15.9	15.3	13.3	12.4	--	15.2	13.0	0.26	0.26	0.29	0.22	0.06	0.19	--	0.2	0.28
W98-20A	13.8	12.5	15.4	14.3	14.3	13.1	--	15.3	14.0	0.16	0.15	0.23	0.12	0.12	0.13	--	0.18	0.25
W99-R5A	14.2	14.9	15.7	14.8	14.8	14.7	15.1	--	13.9	0.24	0.25	0.24	0.22	0.21	0.2	0.2	--	0.27
W99-R5B	13.9	14.4	15.6	14.4	14.5	13.9	14.7	--	13.5	0.26	0.26	0.27	0.23	0.22	0.22	0.22	--	0.28
W98-21A	13.1	14.3	14.2	13.8	13.9	13.8	13.7	15.0	13.7	0.16	0.23	0.29	0.45	0.19	0.19	0.22	0.25	0.29
W98-21B	13.1	13.6	14	13.8	13.7	13.0	13.7	14.7	13.4	0.24	0.27	0.27	0.25	0.18	0.22	0.21	0.24	0.32
W85-6A	14.1	14.1	15.5	14			13.7	15.3	13.9	0.11	0.33	0.34	299			0.23	0.24	0.24
W85-6B	13.6	13.8	16.3	13.7			13.8	15.1	13.1	0.31	0.41	0.33	0.26			0.1	0.11	0.17

Table 3—Comparison of Conventional Parameters (continued)

Well #	DO (mg/L)									pH								
	Feb-04	Apr-04	Aug-04	May-05	Dec-05	Mar-06	Jun-06	Sep-06	Dec-06	Feb-04	Apr-04	Aug-04	May-05	Dec-05	Mar-06	Jun-06	Sep-06	Dec-06
RA-MW-12A	0.24	0.09	0.2	0.13	0.04	0	52.7*	17*	56.41*	8.86	8.73	8.86	8.98	8.41	8.19	8.46	8.54	7.59
RA-MW-12B	0.27	0.07	0.27	0.07	0.05	1.26	45.1*	12.16	73.22*	7.77	7.83	7.92	8.3	8.68	8.16	7.76	7.83	8.06
RA-MW-12C	0.2	0.14	0.42	0.25	0.07	1.1	5.16	4.93	3.33	8.13	7.92	8.09	7.95	8.14	7.89	7.92	7.9	7.74
RA-MW-11A	0.32	0.10	0.66	6.69	0.16	0	24.2*	22.5*	1.8	7.51	7.53	7	6.52	6.64	6.64	6.46	6.48	6.43
RA-MW-11B	0.19	0.15	0.5	0.14	0.1	0.19	26.6*	4.44	2.5	7.66	7.9	7.2	6.7	6.73	7	6.69	6.85	6.86
RA-MW-13A	1.63	0.17	1.13	0.53	0.11	0.38	0.27	1	0	7.15	7.15	7.03	6.7	6.86	6.82	6.82	6.96	7.02
RA-MW-13B	0.73	0.16	0.73	0.51	0.21	0.45	0.35	0.49	0	7.23	7.56	7.3	6.86	6.99	7.15	6.95	7.52	7.04
RA-MW-13C	0.22	0.15	0.43	1.4	2.98	0.96	0.41	0.8	0	7.36	7.35	7.44	7.33	7.48	7.25	7.25	7.45	7.45
RA-MW-17A	0.6	0.19	1.99	0.6	0.2	3.69	--	0.74	0.35	6.55	6.43	6.61	6.2	6.39	6.5	--	6.42	6.66
RA-MW-14A	0.89	0.22	5.96	0.51	0.22	6.74	--	0.88	1.75	6.64	6.81	6.99	6.5	6.6	6.6	--	5.98	6.76
RA-MW-14B	1.08	0.10	2.77	0.42	0.12	2.58	--	0.52	1.73	6.9	7.14	7.33	6.75	6.78	6.87	--	6.4	6.98
RA-MW-16A	0.73	0.27	1.39	1.6	0.11	5.4	0.54	0.49	0.31	6.61	6.61	6.75	6.42	6.44	6.62	6.44	5.96	6.68
RA-MW-16B	0.75	0.15	0.86	0.75	0.33	1.85	0.27	0.27	0.21	6.42	7.12	7.09	6.31	7.12	7.06	6.85	6.09	6.62
RA-MW-15A	0.33	0.21	1.53	0.47	0.15	8.34	0.47	2.89	0.29	6.35	6.37	6.74	6.2	6.3	6.47	6.28	6.09	6.53
RA-MW-15B	0.22	0.10	0.74	0.44	0.18	0.79	0.3	1.25	0.30	6.35	6.83	7.18	6.39	6.39	6.51	6.26	6.61	6.39
B87-8	0.13	1.03	1.06	0.35	0.28	0.53	0.37	0.52	0.25	6.55	6.31	6.73	6.54	6.68	6.57	6.35	6.61	6.71
B85-3	1.11	0.16	1.57	4.5	0.12	2.97	0.22	1.04	0.80	6.49	6.68	6.91	6.39	6.7	6.64	6.42	6.33	6.73
W92-16A	0.98	0.13	2.49	3.1	0.28	0.15	0.45	0.32	0.33	6.42	6.42	6.72	6.6	6.56	6.6	6.67	5.87	6.59
W92-16B	0.14	0.53	1.97	3.4	5.4	1.02	0.54	2.12	0.23	7.51	7.58	7.63	7.59	6.88	7.54	7.38	6.35	7.46
B85-4	0.65	1.37	1.5	0.33	0.2	0.22	0.52	1.61	0.30	6.14	6.26	6.53	6.22	6.51	6.49	6.21	6.28	6.47
W97-18A	1.27	0.74	1.09	0.5	1.1	4	--	1.45	0.90	5.83	5.96	6.19	6.17	6.78	6.57	--	5.08	6.29
W97-18B	2.01	5.56	4.52	4.9	2	1.17	--	4.25	4.59	6.57	6.35	6.67	6.41	6.6	6.16	--	6.25	6.55
W85-7A	4.05	3.17	2.18	4.3	2.2	6.7	5.89	3.09	2.39	6.24	6.04	6.26	6.2	6.3	6.35	6.24	5.69	6.45
W85-7B	2.78	5.11	6.1	8.7	4	10.3	10.96	3.77	0.06	6.63	6.51	6.71	5.91	6.18	6.14	6.37	5.39	6.57
W97-19A	4.72	1.79	22.73	4.6	0.97	3.51	--	3.5	9.37	6.35	6.24	6.28	6.35	6.59	6.41	--	5.53	6.55
W97-19B	1.81	1.31	2.6	2.6	1.1	2.99	--	3.43	4.13	6.68	6.49	6.3	6.47	6.68	6.68	--	5.89	6.83
W98-20A	4.92	3.76	5.5	5	3.2	5.1	--	3.63	9.14	6.01	5.91	6.32	5.97	6.29	6.18	--	4.9	6.26
W99-R5A	4.72	4.26	5.6	5.3	3.3	1.83	5.1	--	6.26	6.03	5.98	6.28	6.21	6.22	6.28	6.23	--	6.40
W99-R5B	3.97	2.71	4.7	5.1	1.9	2.03	4.2	--	4.90	6.2	6.23	6.55	6.33	6.63	6.55	6.26	--	6.62
W98-21A	1.29	1.49	3.03	13.3	1.2	1.05	3.26	2.59	4.97	5.92	6.07	6.68	6.18	6.3	6.25	6.11	4.8	6.16
W98-21B	1.24	3.29	2.82	17.7	3.9	1.08	3.37	2.42	4.90	6.04	6.07	6.9	6.24	6.64	6.36	6.07	5.55	6.38
W85-6A	4.92	0.43	0.85	4.9			1.86	2.06	2.63	6.23	6.22	6.4	6.36			6.25	5.47	6.63
W85-6B	3.46	6.13	6.54	5.5			7.87	3.83	5.15	6.4	6.42	6.68	6.62			8.93	7.16	8.05

\*: Denotes sulfur/sulfate interference with dissolved oxygen readings.



Table 3—Comparison of Conventional Parameters (continued)

Well #	ORP (mV)								
	Feb-04	Apr-04	Aug-04	May-05	Dec-05	Mar-06	Jun-06	Sep-06	Dec-06
RA-MW-12A	-468	-466	-430	-417	-403	-393	-363	-311	-373
RA-MW-12B	-363	-321	-315	-415	-414	-345	-327	-355	-374
RA-MW-12C	-282	-179	-154	-239	-314	-234	-191	-164	-217
RA-MW-11A	-384	-391	-316	-110	-241	-246	-216	-294	-671
RA-MW-11B	-394	-393	-332	-296	-289	-301	-278	-317	-303
RA-MW-13A	-155	-102	-97	-94	-204	-176	-93	-153	-121
RA-MW-13B	-129	-123	-104	-105	-125	-197	-85	-152	-125
RA-MW-13C	-136	-126	-116	-142	-33	-175	-112	-135	-137
RA-MW-17A	-91	-40	-7	-5	-27	-89	--	-106	-34
RA-MW-14A	-77	-41	-54	-75	-82	-136	--	-80	-64
RA-MW-14B	-112	-95	-102	-112	-134	-133	--	-98	-144
RA-MW-16A	-94	-45	-58	-156	-103	-160	-93	-125	-125
RA-MW-16B	-57	-70	-60	-85	-130	-131	-66	-155	-113
RA-MW-15A	-47	4	39	10	-12	-137	-28	-52	-24
RA-MW-15B	-5	28	15	17	-11	16	34	76	32
B87-8	-8	31	17	199	2	73	86	160	167
B85-3	-7	-107	-37	-47	-93	-62	-43	-53	-59
W92-16A	1	-14	30	110	110	-32	61	129	127
W92-16B	-116	-61	-60	73	119	-103	30	253	113
B85-4	10	41	59	218	-26	75	86	179	161
W97-18A	32	57	67	103	58	137	--	317	192
W97-18B	57	63	60	188	83	152	--	233	187
W85-7A	68	83	57	197	116	113	127	246	131
W85-7B	59	73	66	215	132	146	167	259	141
W97-19A	71	94	72	218	69	149	--	311	96
W97-19B	56	86	56	52	76	142	--	295	88
W98-20A	52	116	84	219	116	171	--	366	143
W99-R5A	58	96	97	153	123	197	116	--	131
W99-R5B	58	78	74	201	92	204	111	--	122
W98-21A	28	69	79	182	113	160	114	484	157
W98-21B	33	72	47	202	121	161	117	471	148
W85-6A	17	57	86	163			107	356	123
W85-6B	19	76	72	159			79	340	70

Table 3—Comparison of Conventional Parameters (continued)

Well #	Sulfur (mg/L)									Sulfate (mg/L)								
	Feb-04	Apr-04	Aug-04	May-05	Dec-05	Mar-06	Jun-06	Sep-06	Dec-06	Feb-04	Apr-04	Aug-04	May-05	Dec-05	Mar-06	Jun-06	Sep-06	Dec-06
RA-MW-12A																		
RA-MW-12B																		
RA-MW-12C																		
RA-MW-11A	286	296	304	285	460	448	322	402	342	620	751	1040	736	1200	3040	993	1170	1120
RA-MW-11B																		
RA-MW-13A	743	246	324	372	363	310	213	111	207	1960	712	1056	985	971	1980	682	323	657
RA-MW-13B																		
RA-MW-13C																		
RA-MW-17A																		
RA-MW-14A	189	228	214	136	122	158	124	140	72	477	635	697	357	351	429	396	400	225
RA-MW-14B																		
RA-MW-16A																		
RA-MW-16B																		
RA-MW-15A																		
RA-MW-15B																		
B87-8	9	52	22	17	23	48	21	42	31	21	137	73	170	63	125	74	117	98
B85-3																		
W92-16A																		
W92-16B																		
B85-4	23	150	31	87	20	103	21	59	67	58	410	104	222	50	253	75	169	212
W97-18A																		
W97-18B																		
W85-7A	3	4	5	4	4	3	5	6	3	6	9	15	13	8	8	18	16	7
W85-7B																		
W97-19A																		
W97-19B																		
W98-20A																		
W99-R5A	5	6	4	5	6	7	6	5	5	12	12	13	15	13	15	18	14	14
W99-R5B																		
W98-21A					8	10								19	25			
W98-21B																		
W85-6A		15	14	18	--	--	12	15	7	5	36	44	44	--	--	35	41	21
W85-6B																		

**Table 4—Frontier Hard Chrome—Event 9 Ground Water Elevations 5 December 2006**

<b>Well No.</b>	<b>Time</b>	<b>Casing Elevation (feet)</b>	<b>Depth to Water (feet)</b>	<b>Water level Elevation (AMSL)</b>
W85-3A	1250	26.40	19.16	7.24
W85-3B	1249	26.77	19.53	7.24
W97-18A	1335	25.44	18.38	7.06
W97-18B	1341	25.36	18.19	7.17
B85-4	1347	25.38	18.24	7.14
B87-8	1343	25.95	18.77	7.18
W92-16B	1326	25.51	18.33	7.18
W92-16A	1324	25.62	18.43	7.19
B85-3	1305	24.90	17.66	7.24
W85-7A	1315	22.83	15.67	7.16
W85-7B	1317	23.00	15.85	7.15
W97-19A	1420	22.45	15.34	7.11
W97-19B	1422	21.72	14.67	7.05
W98-20A	1414	23.57	16.4	7.17
W85-6A	1406	25.87	18.68	7.19
W85-6B	1407	26.13	18.98	7.15
W98-21B	1400	25.50	18.34	7.16
W98-21A	1356	25.28	18.14	7.14
W99-R5A	1431	32.26	25.13	7.13
W99-R5B	1433	32.33	25.19	7.14
USGS 14144700 (Stage height of the Columbia River corrected to NGVD 1929)	1200			6.76

<sup>1</sup>Two different elevation datum's have been used at Frontier Hard Chrome. Weston (12/03) Long-Term Monitoring plan has applied a correction factor (+3.76 feet) using the City of Vancouver's benchmark #108 located near FHC site.

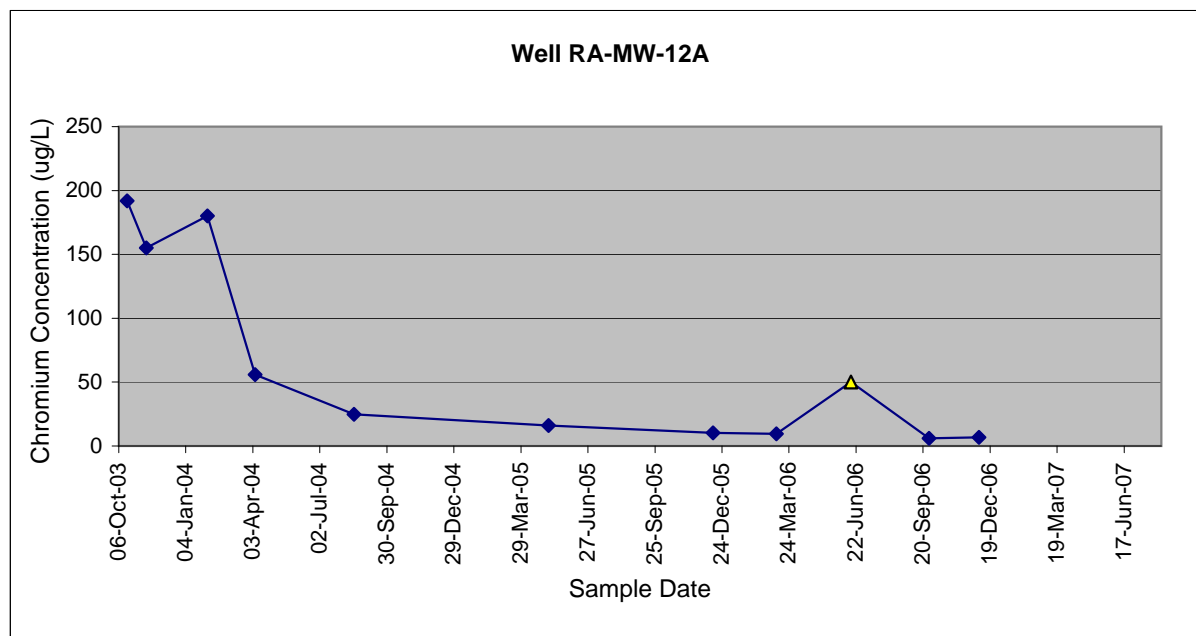
**Table 5—Quality Assurance Sample Results - Chromium**

<b>Well #</b>	<b>Sample Type</b>	<b>Original Sample Chromium Concentration (mg/L)</b>	<b>Duplicate Sample Chromium Concentration (mg/L)</b>	<b>Relative Percent Difference</b>
B87-8 (total)	Field Duplicate	31	33	6%
RA-MW-15B (filtered)	Field Duplicate	16	17	6%

**APPENDIX A**  
**GROUNDWATER CHROMIUM CONCENTRATION TRENDS**

### Well RA-MW-12A

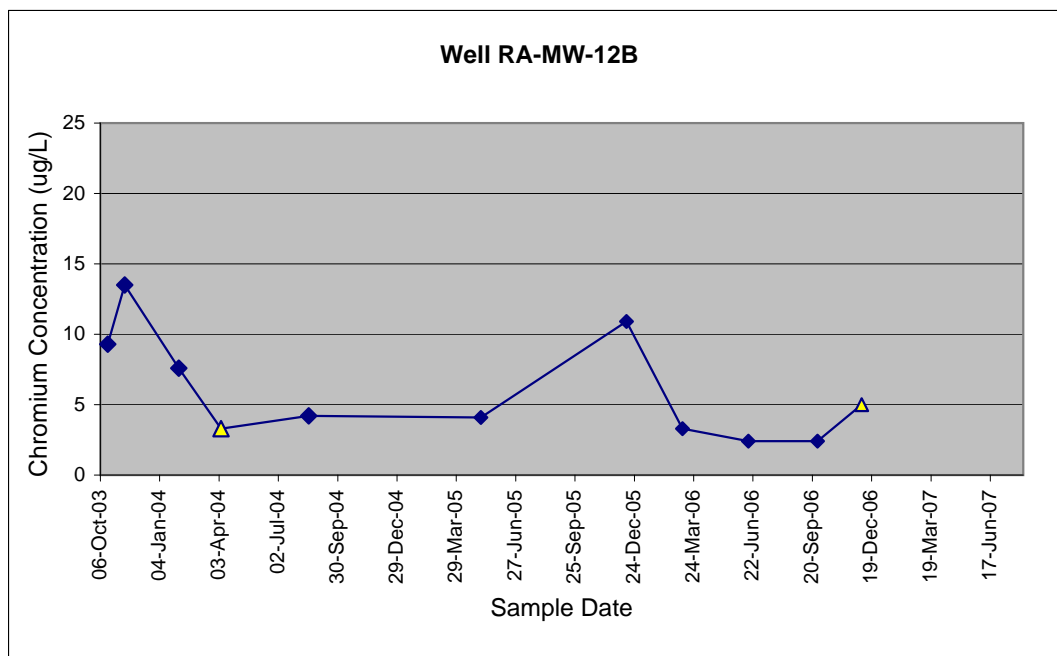
Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2524	Water	17-Oct-03	CHROMIUM	192	UG/L		RA-MW-12A	Dissolved	>10
MJ27F5	Water	12-Nov-03	CHROMIUM	155	UG/L		RA-MW-12A	Dissolved	>10
MJ2AF0	Water	02-Feb-04	CHROMIUM	180	UG/L		RA-MW-12A	Total	7
MJ2BH9	Water	06-Apr-04	CHROMIUM	55.8	UG/L		RA-MW-12A	Dissolved	17
MJ4725	Water	17-Aug-04	CHROMIUM	24.9	UG/L		RA-MW-12A	Dissolved	12
184253	Water	5-May-05	CHROMIUM	16	UG/L		RA-MW-12A	Dissolved	32
05504282	Water	12-Dec-05	CHROMIUM	10.2	UG/L		RA-MW-12A	Dissolved	86
104243	Water	7-Mar-06	CHROMIUM	9.6	UG/L		RA-MW-12A	Dissolved	60
244313	Water	15-Jun-06	CHROMIUM	50	UG/L	U	RA-MW-12A	Dissolved	47
394218	Water	28-Sep-06	CHROMIUM	6	UG/L		RA-MW-12A	Dissolved	80
494110	Water	4-Dec-06	CHROMIUM	6.8	UG/L		RA-MW-12A	Dissolved	12



Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.

### Well RA-MW-12B

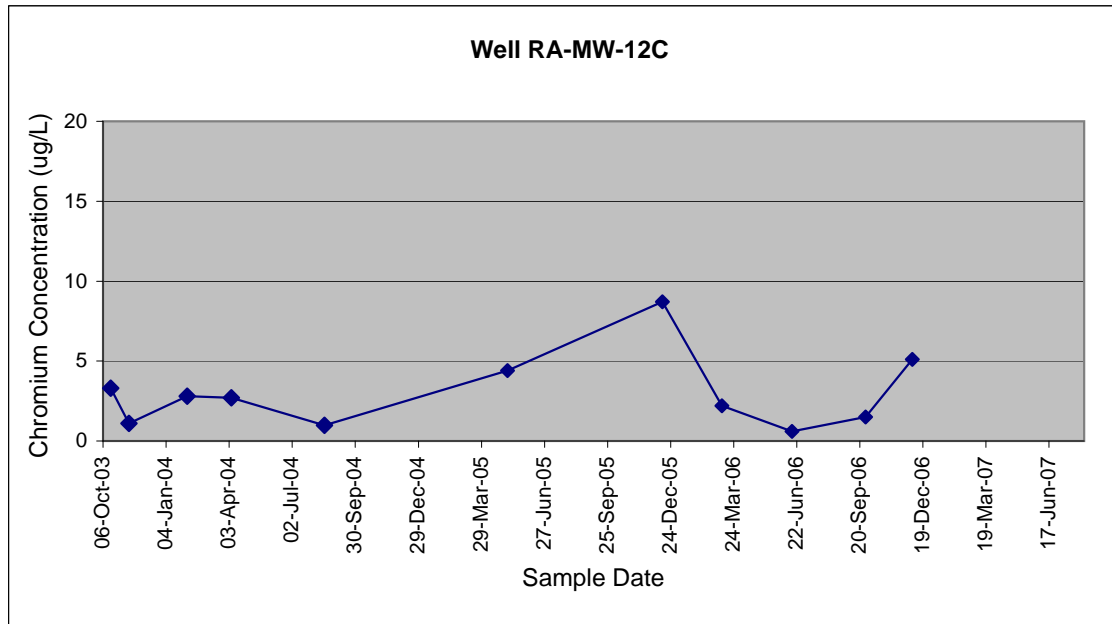
Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2526	Water	17-Oct-03	CHROMIUM	9.3	UG/L	BJ	RA-MW-12B	Dissolved	>10
MJ27F7	Water	12-Nov-03	CHROMIUM	13.5	UG/L		RA-MW-12B	Dissolved	>10
MJ2AF1	Water	02-Feb-04	CHROMIUM	7.6	UG/L	J	RA-MW-12B	Total	6
MJ2BJ0	Water	06-Apr-04	CHROMIUM	3.3	UG/L	U	RA-MW-12B	Total	0
MJ4726	Water	17-Aug-04	CHROMIUM	4.2	UG/L	J	RA-MW-12B	Total	2
184254	Water	5-May-05	CHROMIUM	4.1	UG/L		RA-MW-12B	Total	4.5
05504283	Water	12-Dec-05	CHROMIUM	10.9	UG/L		RA-MW-12B	Total	8
104242	Water	7-Mar-06	CHROMIUM	3.3	UG/L		RA-MW-12B	Total	1.7
244315	Water	15-Jun-06	CHROMIUM	2.4	UG/L		RA-MW-12B	Total	14
394216	Water	28-Sep-06	CHROMIUM	2.4	UG/L		RA-MW-12B	Total	1
494108	Water	4-Dec-06	CHROMIUM	5	UG/L	U	RA-MW-12B	Total	2



Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.

**Well RA-MW-12C**

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2528	Water	17-Oct-03	CHROMIUM	3.3	UG/L	BJ	RA-MW-12C	Dissolved	>10
MJ27F9	Water	12-Nov-03	CHROMIUM	1.1	UG/L	BJ	RA-MW-12C	Dissolved	>10
MJ2AF2	Water	03-Feb-04	CHROMIUM	2.8	UG/L	J	RA-MW-12C	Total	1
MJ2BJ1	Water	06-Apr-04	CHROMIUM	2.7	UG/L	J	RA-MW-12C	Total	0
MJ4727	Water	17-Aug-04	CHROMIUM	0.98	UG/L	J	RA-MW-12C	Total	2
184255	Water	5-May-05	CHROMIUM	4.4	UG/L		RA-MW-12C	Total	5.2
05504284	Water	12-Dec-05	CHROMIUM	8.7	UG/L		RA-MW-12C	Total	3
104245	Water	7-Mar-06	CHROMIUM	2.2	UG/L		RA-MW-12C	Total	1
244317	Water	15-Jun-06	CHROMIUM	0.6	UG/L	J	RA-MW-12C	Total	0.3
394215	Water	28-Sep-06	CHROMIUM	1.5	UG/L		RA-MW-12C	Total	0.4
494117	Water	4-Dec-06	CHROMIUM	5.1	UG/L		RA-MW-12C	Total	3

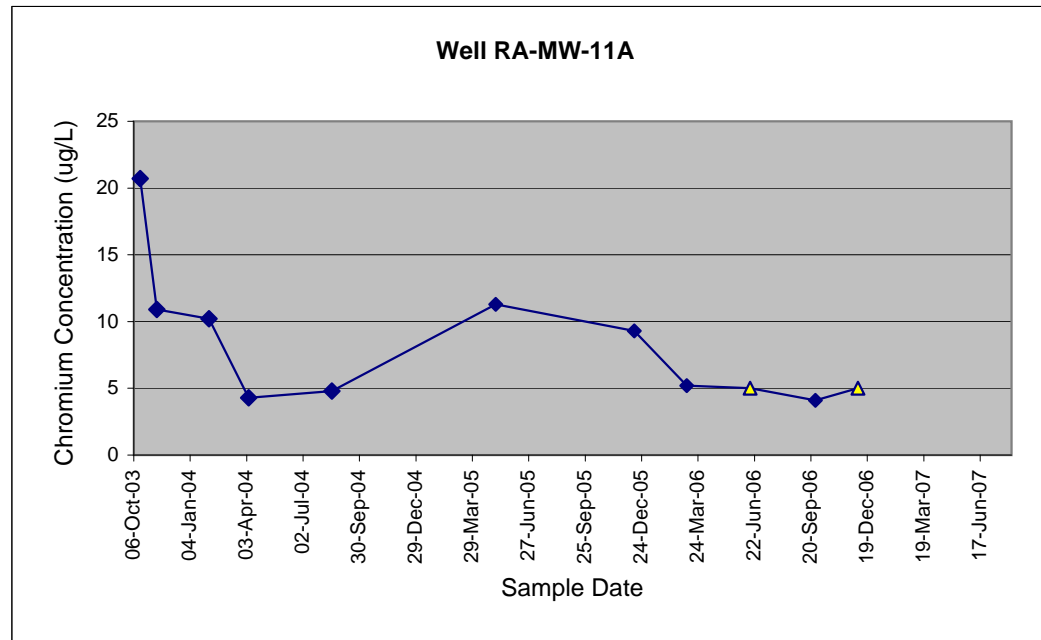


Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.



### Well RA-MW-11A

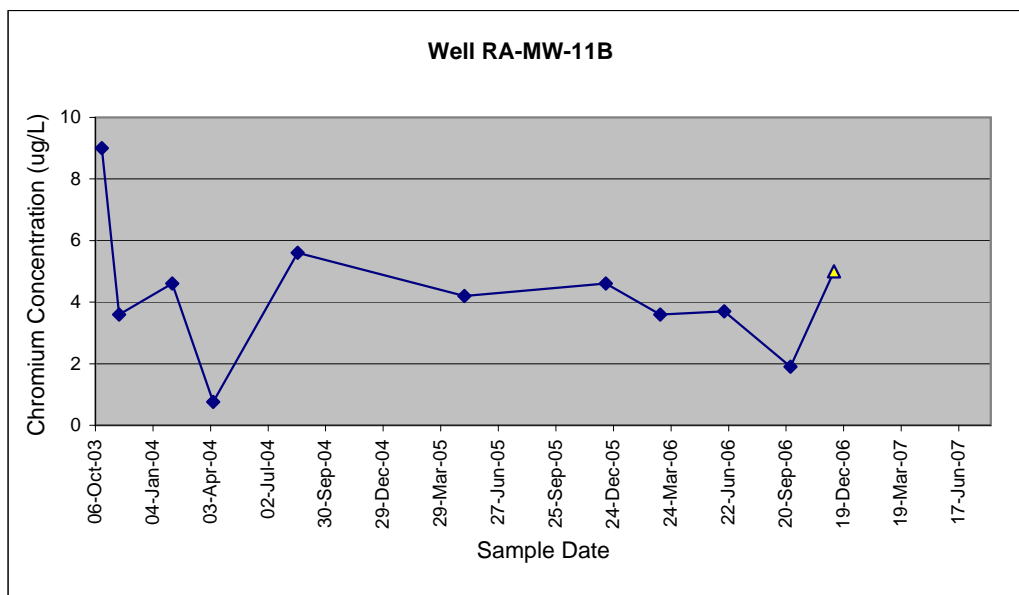
Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2516	Water	16-Oct-03	CHROMIUM	20.7	UG/L		RA-MW-11A	Dissolved	>10
MJ27G1	Water	12-Nov-03	CHROMIUM	10.9	UG/L	J	RA-MW-11A	Dissolved	>10
MJ2AF4	Water	03-Feb-04	CHROMIUM	10.2	UG/L		RA-MW-11A	Dissolved	800
MJ2BJ3	Water	06-Apr-04	CHROMIUM	4.3	UG/L	J	RA-MW-11A	Dissolved	783
MJ4728	Water	17-Aug-04	CHROMIUM	4.8	UG/L	J	RA-MW-11A	Total	<10
184250	Water	5-May-05	CHROMIUM	11.3	UG/L		RA-MW-11A	Total	2
05504280	Water	12-Dec-05	CHROMIUM	9.3	UG/L		RA-MW-11A	Total	4
104232	Water	6-Mar-06	CHROMIUM	5.2	UG/L		RA-MW-11A	Total	1
244318	Water	15-Jun-06	CHROMIUM	5	UG/L	UJ	RA-MW-11A	Total	2
394213	Water	27-Sep-06	CHROMIUM	4.1	UG/L		RA-MW-11A	Total	0.5
494106	Water	4-Dec-06	CHROMIUM	5	UG/L	U	RA-MW-11A	Total	1



Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.

### Well RA-MW-11B

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2518	Water	16-Oct-03	CHROMIUM	9	UG/L	BJ	RA-MW-11B	Dissolved	>10
MJ27G3	Water	12-Nov-03	CHROMIUM	3.6	UG/L	BJ	RA-MW-11B	Dissolved	>10
MJ2AF6	Water	03-Feb-04	CHROMIUM	4.6	UG/L	J	RA-MW-11B	Dissolved	550
MJ2BJ5	Water	7-Apr-04	CHROMIUM	0.76	UG/L	J	RA-MW-11B	Dissolved	1100
MJ4730	Water	17-Aug-04	CHROMIUM	5.6	UG/L	J	RA-MW-11B	Total	114
184251	Water	5-May-05	CHROMIUM	4.2	UG/L		RA-MW-11B	Total	7.1
05504281	Water	12-Dec-05	CHROMIUM	4.6	UG/L		RA-MW-11B	Dissolved	13
104241	Water	7-Mar-06	CHROMIUM	3.6	UG/L		RA-MW-11B	Total	5
244319	Water	15-Jun-06	CHROMIUM	3.7	UG/L		RA-MW-11B	Total	3
394214	Water	27-Sep-06	CHROMIUM	1.9	UG/L		RA-MW-11B	Total	0.3
494107	Water	4-Dec-06	CHROMIUM	5	UG/L	U	RA-MW-11B	Total	0.5

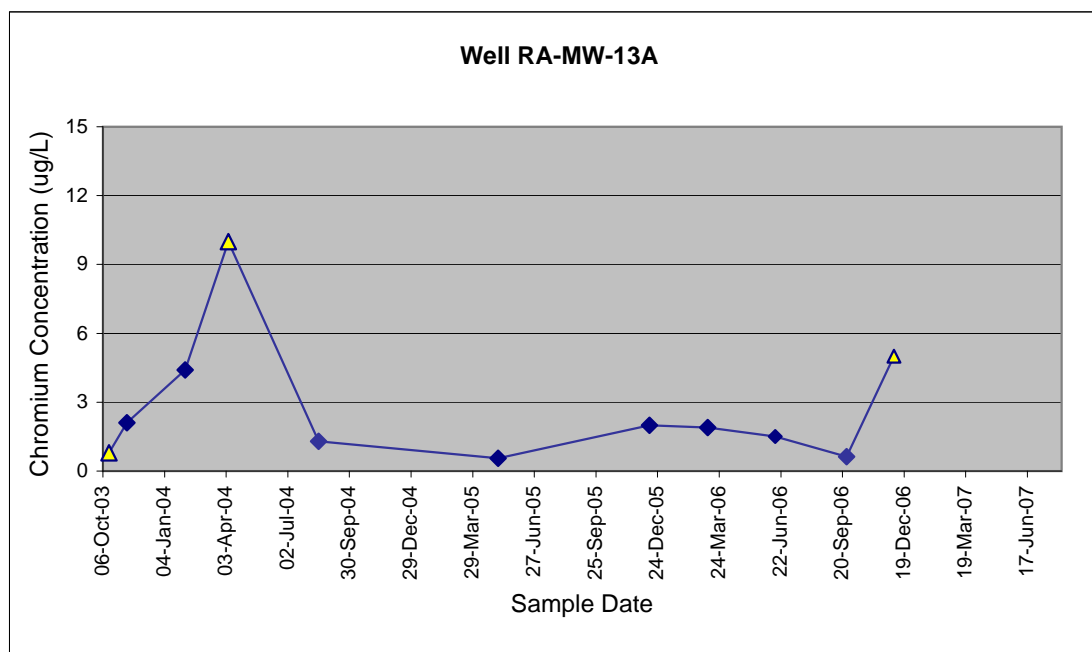


Note: The total Cr concentration was used for the August 2004 event because the dissolved concentration had a higher detection limit (10U).

Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.

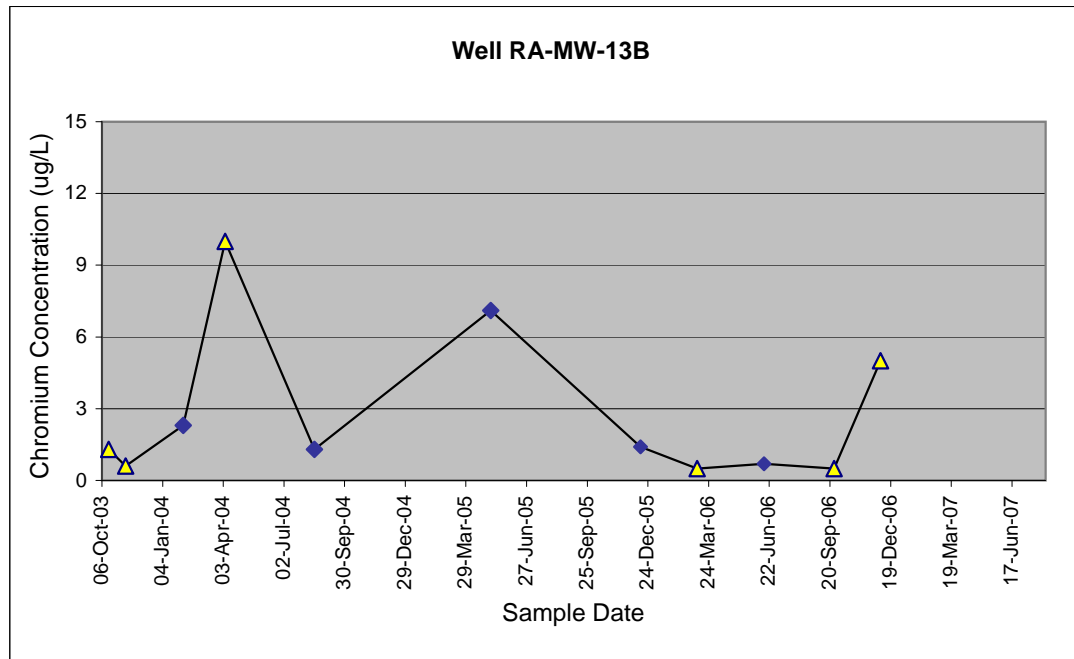
### Well RA-MW-13A

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2508	Water	15-Oct-03	CHROMIUM	0.8	UG/L	U	RA-MW-13A	Total	<10
MJ27E2	Water	10-Nov-03	CHROMIUM	2.1	UG/L	BJ	RA-MW-13A	Total	>10
MJ2AG1	Water	03-Feb-04	CHROMIUM	4.4	UG/L	J	RA-MW-13A	Total	4
MJ2BH4	Water	6-Apr-04	CHROMIUM	10	UG/L	U	RA-MW-13A	Total	7
MJ4718	Water	16-Aug-04	CHROMIUM	1.3	UG/L	J	RA-MW-13A	Total	9
184261	Water	5-May-05	CHROMIUM	0.56	UG/L		RA-MW-13A	Total	6.4
05504285	Water	12-Dec-05	CHROMIUM	2	UG/L		RA-MW-13A	Total	6.4
104246	Water	7-Mar-06	CHROMIUM	1.9	UG/L		RA-MW-13A	Total	4
244301	Water	14-Jun-06	CHROMIUM	1.5	UG/L		RA-MW-13A	Total	0.7
394194	Water	26-Sep-06	CHROMIUM	0.63	UG/L		RA-MW-13A	Total	2
494102	Water	4-Dec-06	CHROMIUM	5	UG/L	U	RA-MW-13A	Total	0.3



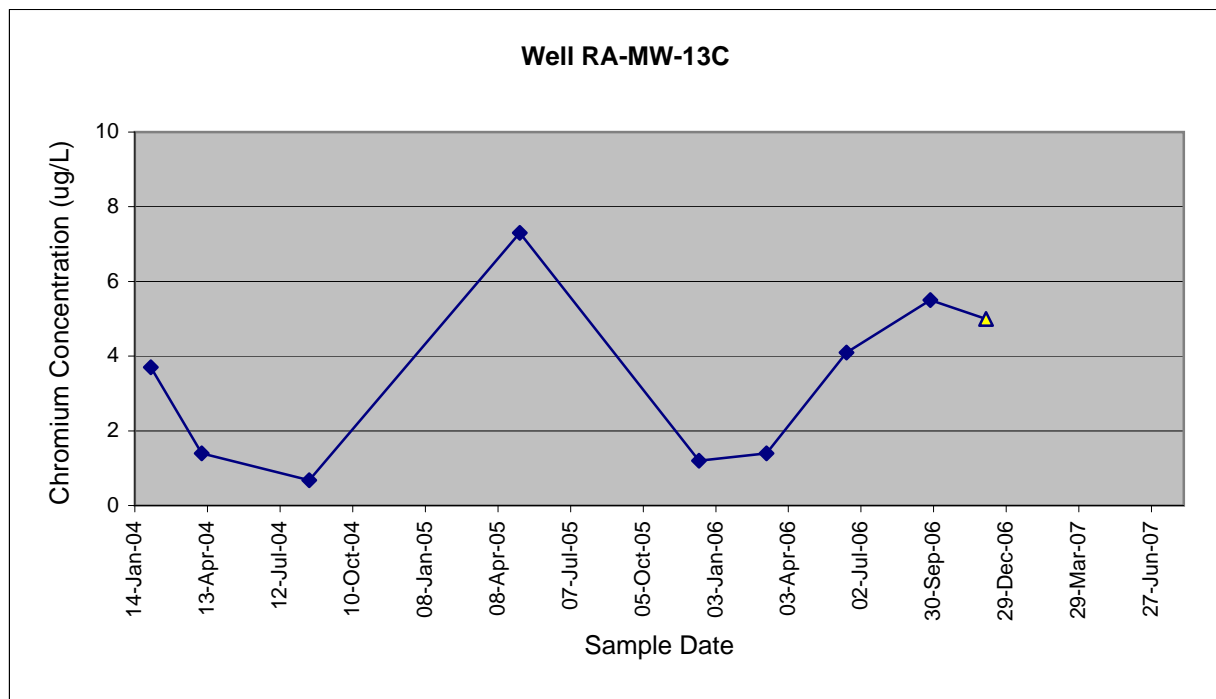
### Well RA-MW-13B

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2509	Water	16-Oct-03	CHROMIUM	1.3	UG/L	U	RA-MW-13B	Total	<10
MJ27E3	Water	10-Nov-03	CHROMIUM	0.6	UG/L	UJ	RA-MW-13B	Total	<10
MJ2AF8	Water	03-Feb-04	CHROMIUM	2.3	UG/L	J	RA-MW-13B	Total	3
MJ2BH5	Water	6-Apr-04	CHROMIUM	10	UG/L	U	RA-MW-13B	Total	1
MJ4720	Water	16-Aug-04	CHROMIUM	1.3	UG/L	J	RA-MW-13B	Total	2
184262	Water	5-May-05	CHROMIUM	7.1	UG/L		RA-MW-13B	Total	2.8
05504286	Water	13-Dec-05	CHROMIUM	1.4	UG/L		RA-MW-13B	Total	1.7
104247	Water	7-Mar-06	CHROMIUM	0.5	UG/L	U	RA-MW-13B	Total	0
244302	Water	14-Jun-06	CHROMIUM	0.7	UG/L		RA-MW-13B	Total	0.8
394195	Water	26-Sep-06	CHROMIUM	0.5	UG/L	U	RA-MW-13B	Total	2
494103	Water	4-Dec-06	CHROMIUM	5	UG/L	U	RA-MW-13B	Total	0.5



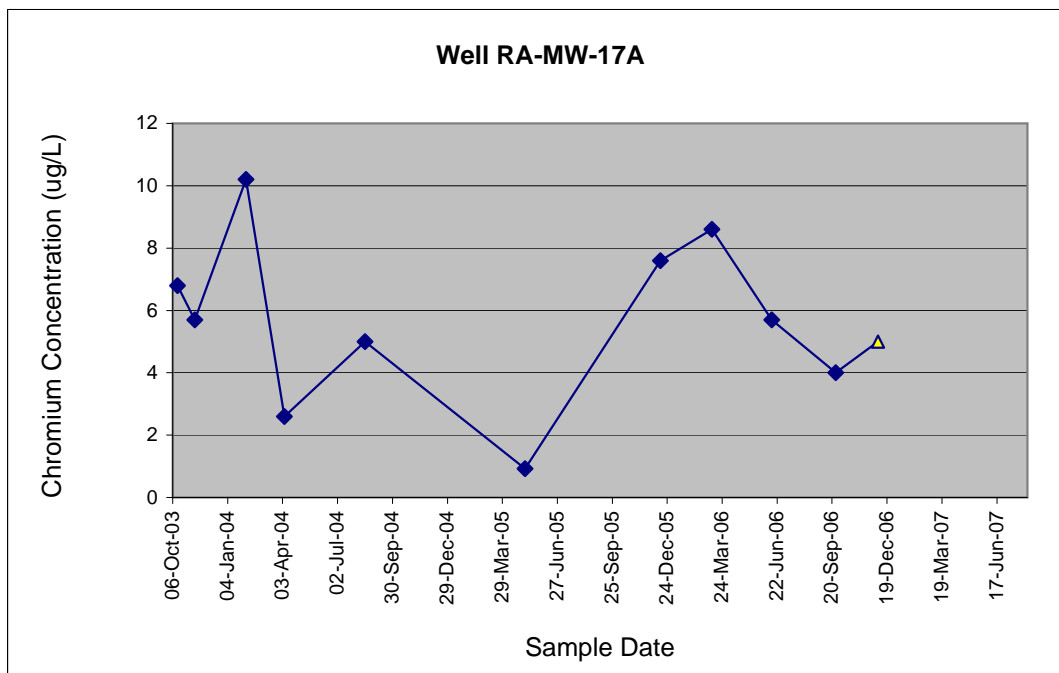
### Well RA-MW-13C

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AF9	Water	03-Feb-04	CHROMIUM	3.7	UG/L	J	RA-MW-13C	Total	2
MJ2BH6	Water	6-Apr-04	CHROMIUM	1.4	UG/L	J	RA-MW-13C	Total	0
MJ4721	Water	17-Aug-04	CHROMIUM	0.68	UG/L	J	RA-MW-13C	Total	2
184263	Water	5-May-05	CHROMIUM	7.3	UG/L		RA-MW-13C	Total	9.8
05504287	Water	13-Dec-05	CHROMIUM	1.2	UG/L		RA-MW-13C	Total	0.1
104248	Water	7-Mar-06	CHROMIUM	1.4	UG/L		RA-MW-13C	Total	6
244303	Water	14-Jun-06	CHROMIUM	4.1	UG/L		RA-MW-13C	Total	5
394196	Water	26-Sep-06	CHROMIUM	5.5	UG/L		RA-MW-13C	Total	9.7
494104	Water	4-Dec-06	CHROMIUM	5	UG/L	U	RA-MW-13C	Total	8



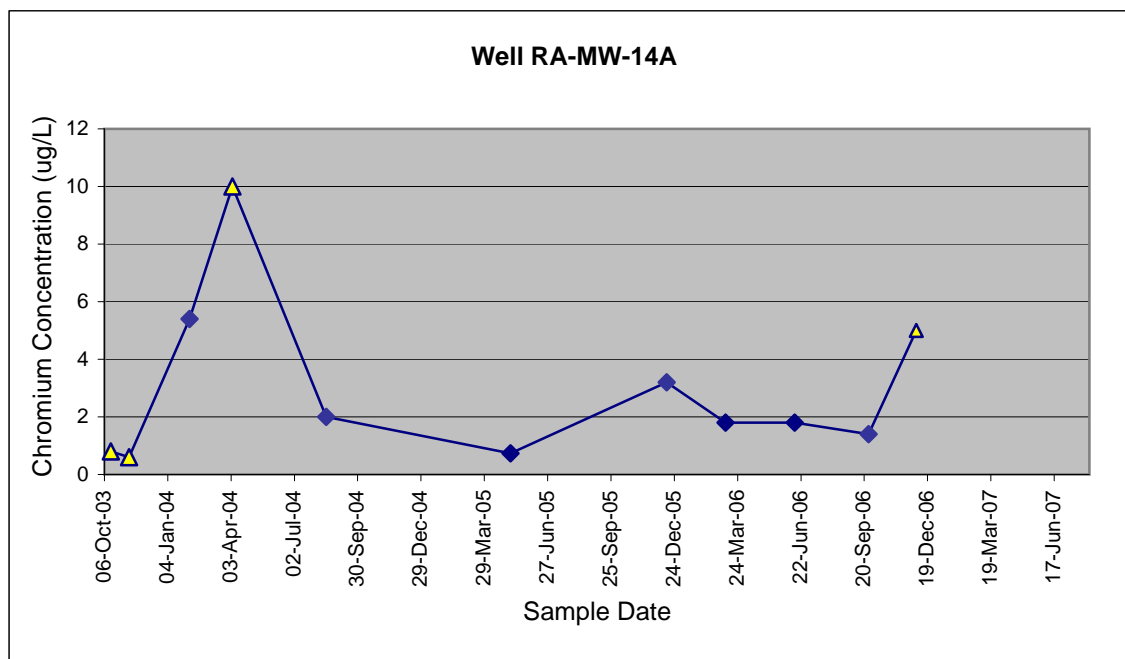
### Well RA-MW-17A

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2501	Water	14-Oct-03	CHROMIUM	6.8	UG/L	BJ	RA-MW-17A	Total	<10
MJ27E5	Water	11-Nov-03	CHROMIUM	5.7	UG/L	BJ	RA-MW-17A	Total	<10
MJ2AG0	Water	03-Feb-04	CHROMIUM	10.2	UG/L	J	RA-MW-17A	Total	1
MJ2BH7	Water	6-Apr-04	CHROMIUM	2.6	UG/L	J	RA-MW-17A	Total	0
MJ4715	Water	16-Aug-04	CHROMIUM	5	UG/L	J	RA-MW-17A	Total	1
184260	Water	5-May-05	CHROMIUM	0.92	UG/L		RA-MW-17A	Total	10
05504299	Water	13-Dec-05	CHROMIUM	7.6	UG/L		RA-MW-17A	Total	3.1
104240	Water	7-Mar-06	CHROMIUM	8.6	UG/L		RA-MW-17A	Total	7
244293	Water	13-Jun-06	CHROMIUM	5.7	UG/L		RA-MW-17A	Total	1
394193	Water	26-Sep-06	CHROMIUM	4	UG/L		RA-MW-17A	Total	1
494105	Water	4-Dec-06	CHROMIUM	5	UG/L	U	RA-MW-17A	Total	0.8



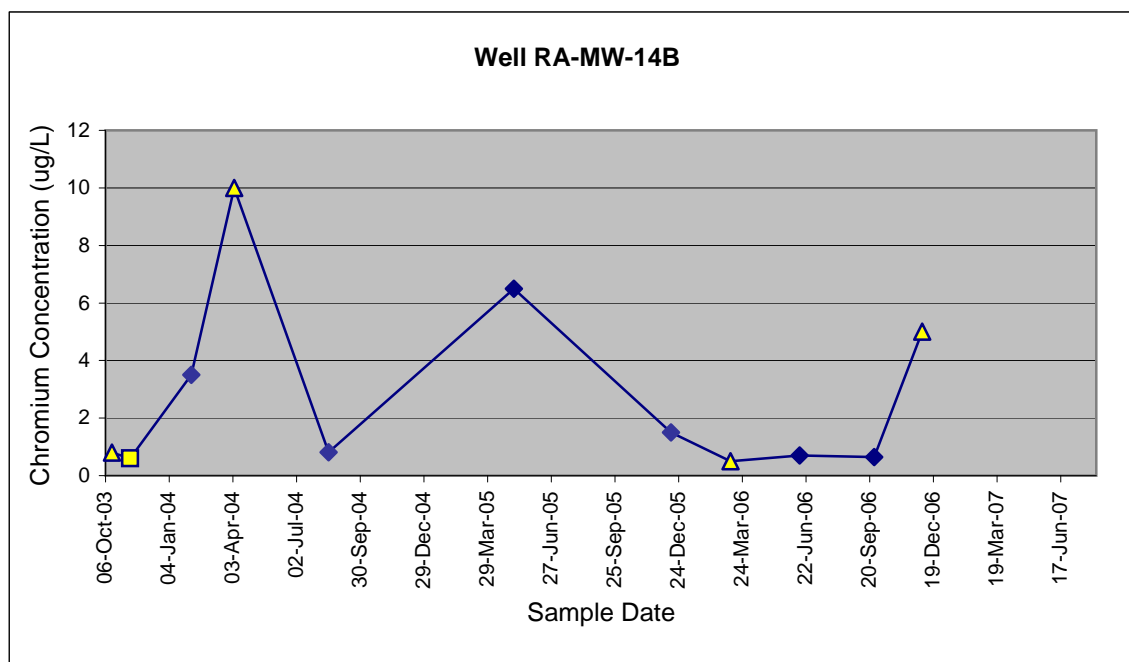
### Well RA-MW-14A

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2504	Water	15-Oct-03	CHROMIUM	0.8	UG/L	U	RA-MW-14A	Total	<10
MJ27D8	Water	10-Nov-03	CHROMIUM	0.6	UG/L	UJ	RA-MW-14A	Total	<10
MJ2AG2	Water	04-Feb-04	CHROMIUM	5.4	UG/L	J	RA-MW-14A	Total	0
MJ2BG5	Water	5-Apr-04	CHROMIUM	10	UG/L	U	RA-MW-14A	Total	5
MJ4712	Water	16-Aug-04	CHROMIUM	2	UG/L	J	RA-MW-14A	Total	3
184258	Water	5-May-05	CHROMIUM	0.73	UG/L		RA-MW-14A	Total	7.5
05504294	Water	13-Dec-05	CHROMIUM	3.2	UG/L		RA-MW-14A	Total	1.5
104250	Water	7-Mar-06	CHROMIUM	1.8	UG/L		RA-MW-14A	Total	1
244294	Water	13-Jun-06	CHROMIUM	1.8	UG/L		RA-MW-14A	Total	1
394198	Water	26-Sep-06	CHROMIUM	1.4	UG/L		RA-MW-14A	Total	0.3
494100	Water	3-Dec-06	CHROMIUM	5	UG/L	U	RA-MW-14A	Total	0.1



### Well RA-MW-14B

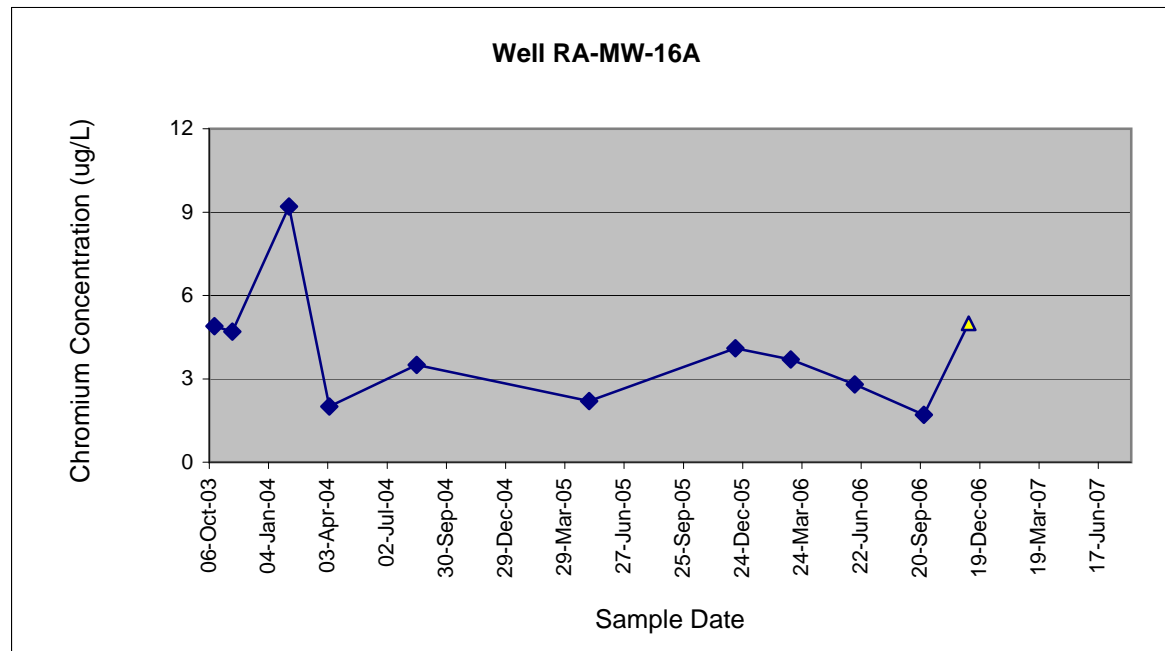
Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2505	Water	15-Oct-03	CHROMIUM	0.8	UG/L	U	RA-MW-14B	Total	<10
MJ27D9	Water	10-Nov-03	CHROMIUM	0.6	UG/L	R	RA-MW-14B	Total	<10
MJ2AG4	Water	04-Feb-04	CHROMIUM	3.5	UG/L	J	RA-MW-14B	Total	1
MJ2BG7	Water	5-Apr-04	CHROMIUM	10	UG/L	U	RA-MW-14B	Total	0
MJ4714	Water	16-Aug-04	CHROMIUM	0.81	UG/L	J	RA-MW-14B	Total	2
184259	Water	5-May-05	CHROMIUM	6.5	UG/L		RA-MW-14B	Total	5.6
05504295	Water	13-Dec-05	CHROMIUM	1.5	UG/L		RA-MW-14B	Total	6.1
104249	Water	7-Mar-06	CHROMIUM	0.5	UG/L	U	RA-MW-14B	Total	4
244295	Water	13-Jun-06	CHROMIUM	0.7	UG/L		RA-MW-14B	Total	9
394199	Water	26-Sep-06	CHROMIUM	0.64	UG/L		RA-MW-14B	Total	2
494101	Water	3-Dec-06	CHROMIUM	5	UG/L	U	RA-MW-14B	Total	0.2





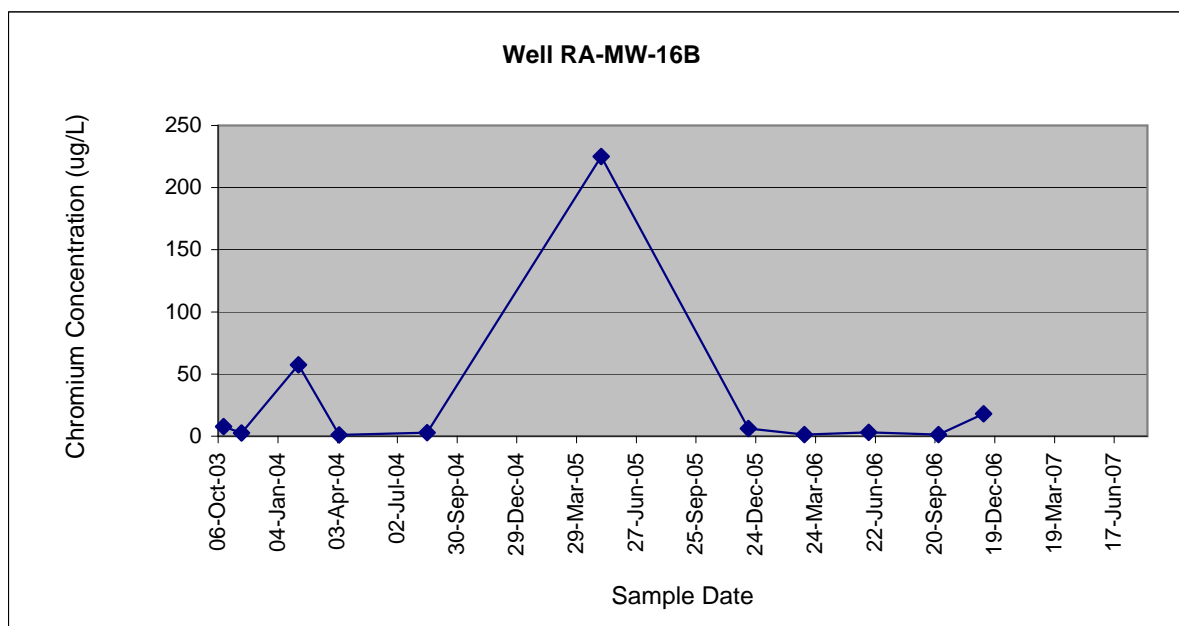
### Well RA-MW-16A

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2502	Water	14-Oct-03	CHROMIUM	4.9	UG/L	BJ	RA-MW-16A	Total	<10
MJ27E0	Water	10-Nov-03	CHROMIUM	4.7	UG/L	BJ	RA-MW-16A	Total	<10
MJ2AG5	Water	04-Feb-04	CHROMIUM	9.2	UG/L	J	RA-MW-16A	Total	1
MJ2BG8	Water	5-Apr-04	CHROMIUM	2	UG/L	J	RA-MW-16A	Total	1
MJ4716	Water	16-Aug-04	CHROMIUM	3.5	UG/L	J	RA-MW-16A	Total	2
184257	Water	5-May-05	CHROMIUM	2.2	UG/L		RA-MW-16A	Total	8.5
05504293	Water	13-Dec-05	CHROMIUM	4.1	UG/L		RA-MW-16A	Total	1.2
104238	Water	7-Mar-06	CHROMIUM	3.7	UG/L		RA-MW-16A	Total	1.7
244304	Water	12-Jun-06	CHROMIUM	2.8	UG/L		RA-MW-16A	Total	1
394189	Water	25-Sep-06	CHROMIUM	1.7	UG/L		RA-MW-16A	Total	1
494087	Water	2-Dec-06	CHROMIUM	5	UG/L	U	RA-MW-16A	Total	0.1



### Well RA-MW-16B

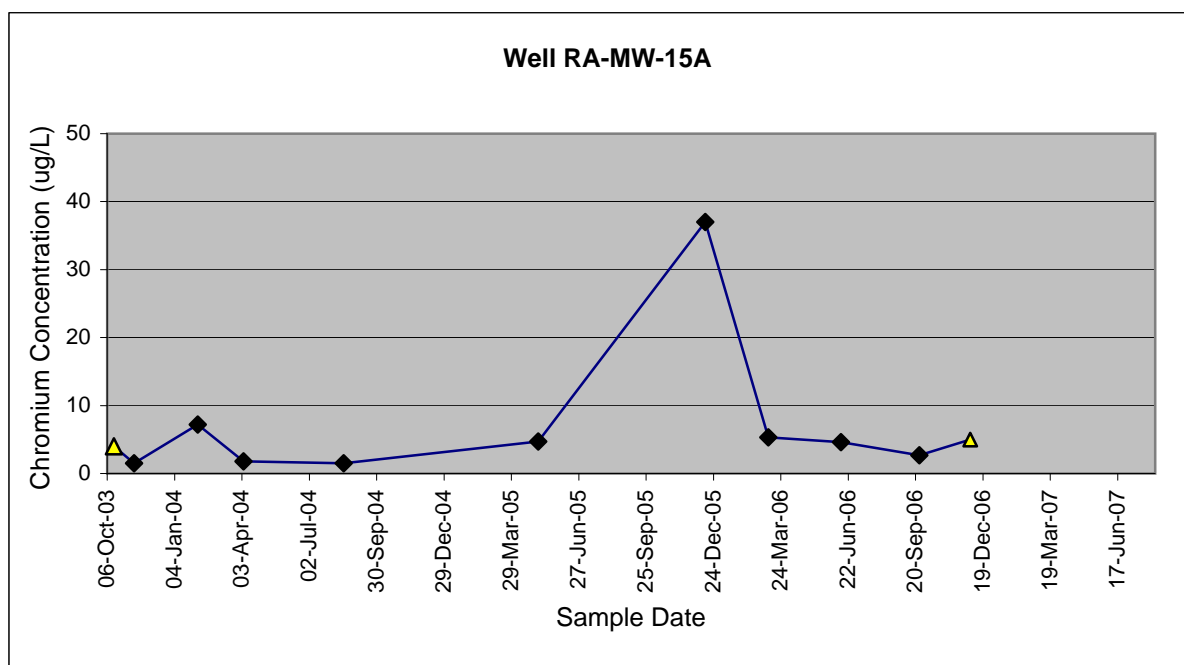
Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2503	Water	14-Oct-03	CHROMIUM	7.6	UG/L	BJ	RA-MW-16B	Total	<10
MJ27E1	Water	10-Nov-03	CHROMIUM	2.5	UG/L	BJ	RA-MW-16B	Total	<10
MJ2AG6	Water	04-Feb-04	CHROMIUM	57.4	UG/L	BJ	RA-MW-16B	Total	1
MJ2BH0	Water	5-Apr-04	CHROMIUM	1	UG/L	J	RA-MW-16B	Dissolved	0
MJ4717	Water	16-Aug-04	CHROMIUM	2.8	UG/L	J	RA-MW-16B	Total	3.6
184256	Water	5-May-05	CHROMIUM	225	UG/L		RA-MW-16B	Total	5.7
05504291	Water	13-Dec-05	CHROMIUM	6.1	UG/L		RA-MW-16B	Dissolved	3.9
104239	Water	7-Mar-06	CHROMIUM	1.3	UG/L		RA-MW-16B	Total	0
244305	Water	12-Jun-06	CHROMIUM	3.2	UG/L		RA-MW-16B	Total	0.3
394187	Water	25-Sep-06	CHROMIUM	1.3	UG/L		RA-MW-16B	Dissolved	0.7
494089	Water	2-Dec-06	CHROMIUM	18	UG/L		RA-MW-16B	Dissolved	0.2



Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.

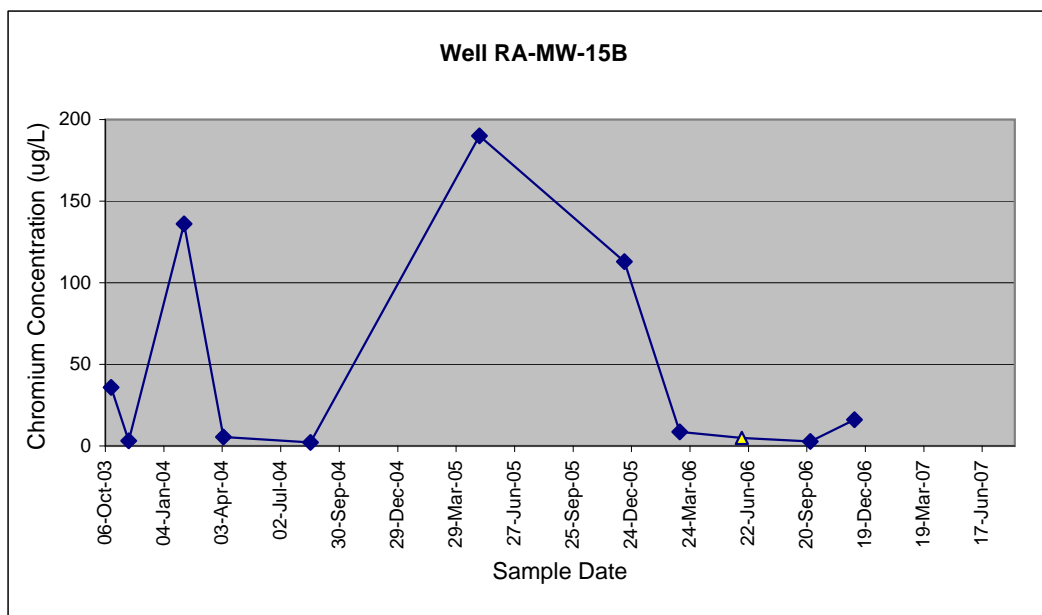
### Well RA-MW-15A

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2506	Water	15-Oct-03	CHROMIUM	4	UG/L	U	RA-MW-15A	Total	<10
MJ27E8	Water	11-Nov-03	CHROMIUM	1.5	UG/L	BJ	RA-MW-15A	Total	<10
MJ2AG7	Water	04-Feb-04	CHROMIUM	7.2	UG/L	J	RA-MW-15A	Total	1
MJ2BH1	Water	5-Apr-04	CHROMIUM	1.8	UG/L	J	RA-MW-15A	Total	0
MJ4722	Water	17-Aug-04	CHROMIUM	1.5	UG/L	J	RA-MW-15A	Total	0
184248	Water	4-May-05	CHROMIUM	4.7	UG/L		RA-MW-15A	Total	2
05504290	Water	13-Dec-05	CHROMIUM	37	UG/L		RA-MW-15A	Total	1.3
104251	Water	7-Mar-06	CHROMIUM	5.3	UG/L		RA-MW-15A	Total	0
244290	Water	12-Jun-06	CHROMIUM	4.6	UG/L		RA-MW-15A	Total	0.6
394192	Water	25-Sep-06	CHROMIUM	2.7	UG/L		RA-MW-15A	Total	0.2
494090	Water	2-Dec-06	CHROMIUM	5	UG/L	U	RA-MW-15A	Total	2



### Well RA-MW-15B

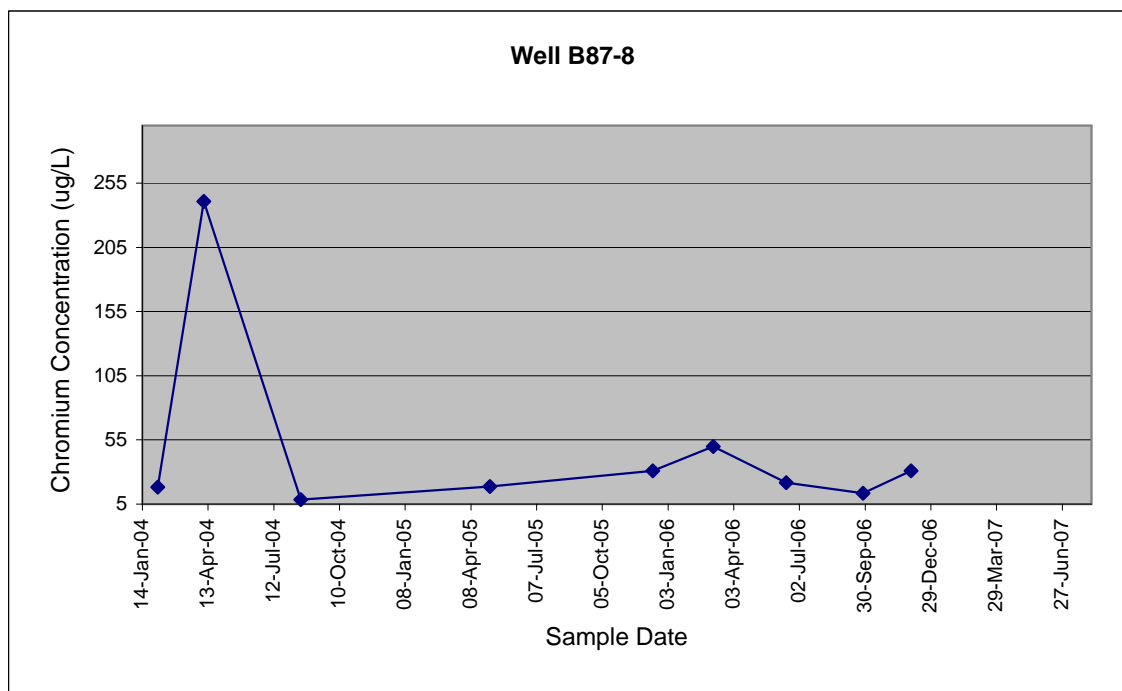
Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2507	Water	15-Oct-03	CHROMIUM	35.8	UG/L		RA-MW-15B	Total	<10
MJ27E9	Water	11-Nov-03	CHROMIUM	3.2	UG/L	BJ	RA-MW-15B	Total	<10
MJ2AG8	Water	04-Feb-04	CHROMIUM	136	UG/L		RA-MW-15B	Total	2
MJ2BH2	Water	5-Apr-04	CHROMIUM	5.5	UG/L	J	RA-MW-15B	Total	0
MJ4723	Water	17-Aug-04	CHROMIUM	2.2	UG/L	J	RA-MW-15B	Total	1
184249	Water	4-May-05	CHROMIUM	190	UG/L		RA-MW-15B	Total	9.7
05504288	Water	13-Dec-05	CHROMIUM	113	UG/L		RA-MW-15B	Total	3.5
104252	Water	8-Mar-06	CHROMIUM	8.7	UG/L		RA-MW-15B	Dissolved	5
244292	Water	12-Jun-06	CHROMIUM	5	UG/L	U	RA-MW-15B	Dissolved	4
394190	Water	25-Sep-06	CHROMIUM	2.8	UG/L		RA-MW-15B	Dissolved	4
494092	Water	2-Dec-06	CHROMIUM	16	UG/L		RA-MW-15B	Dissolved	7



Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.

### Well B87-8

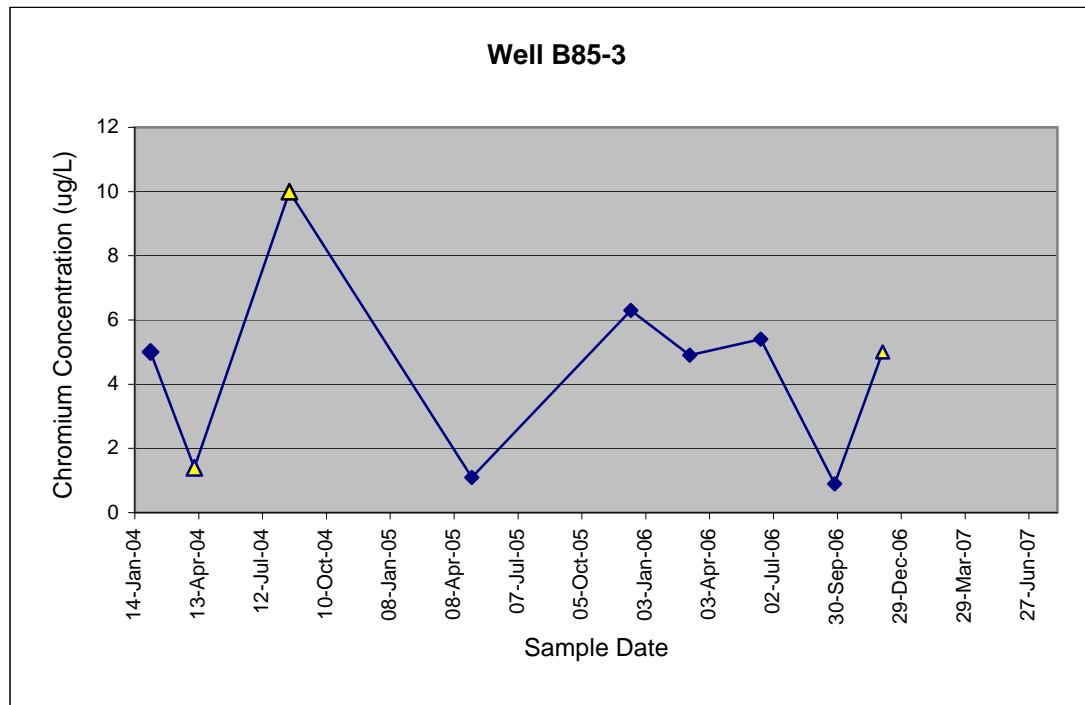
Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AG9	Water	04-Feb-04	CHROMIUM	18.2	UG/L		B87-8	Total	2
MJ2BK0	Water	7-Apr-04	CHROMIUM	241	UG/L		B87-8	Total	8
MJ4737	Water	18-Aug-04	CHROMIUM	8.5	UG/L	J	B87-8	Dissolved	36
184247	Water	4-May-05	CHROMIUM	18.8	UG/L		B87-8	Total	6.5
05504297	Water	13-Dec-05	CHROMIUM	31	UG/L		B87-8	Total	5.1
104236	Water	6-Mar-06	CHROMIUM	50	UG/L		B87-8	Total	8
244308	Water	14-Jun-06	CHROMIUM	21.8	UG/L		B87-8	Total	3
394204	Water	27-Sep-06	CHROMIUM	13.4	UG/L		B87-8	Dissolved	13
494082	Water	2-Dec-06	CHROMIUM	31	UG/L		B87-8	Total	0.1



Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.

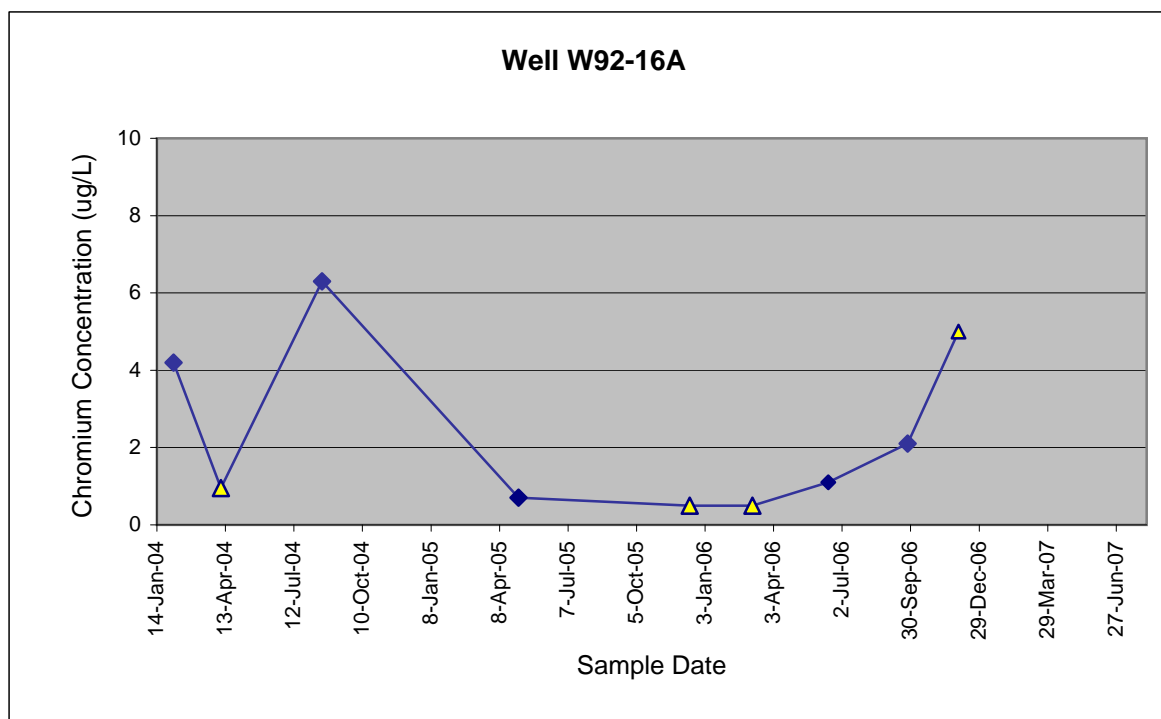
### Well B85-3

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AH0	Water	05-Feb-04	CHROMIUM	5	UG/L	J	B85-3	Total	1
MJ2BJ6	Water	7-Apr-04	CHROMIUM	1.4	UG/L	U	B85-3	Total	3
MJ4732	Water	18-Aug-04	CHROMIUM	10	UG/L	U	B85-3	Total	0
184232	Water	3-May-05	CHROMIUM	1.1	UG/L		B85-3	Total	2.8
05504298	Water	13-Dec-05	CHROMIUM	6.3	UG/L		B85-3	Total	8.1
104235	Water	6-Mar-06	CHROMIUM	4.9	UG/L		B85-3	Total	7
244311	Water	14-Jun-06	CHROMIUM	5.4	UG/L		B85-3	Total	6
394197	Water	26-Sep-06	CHROMIUM	0.9	UG/L		B85-3	Total	1
494094	Water	3-Dec-06	CHROMIUM	5	UG/L	U	B85-3	Total	7



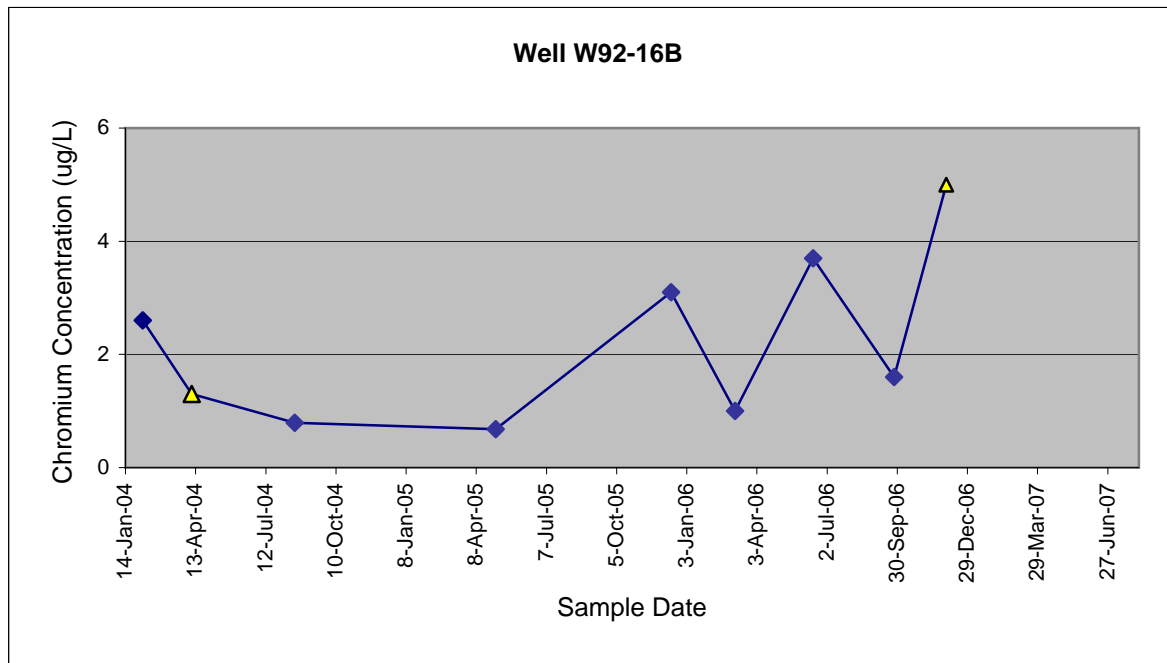
### Well W92-16A

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AH1	Water	05-Feb-04	CHROMIUM	4.2	UG/L	J	W92-16A	Total	2
MJ2BJ7	Water	7-Apr-04	CHROMIUM	0.95	UG/L	U	W92-16A	Total	0
MJ4734	Water	18-Aug-04	CHROMIUM	6.3	UG/L	J	W92-16A	Total	0
184234	Water	3-May-05	CHROMIUM	0.7	UG/L		W92-16A	Total	0.7
05504311	Water	14-Dec-05	CHROMIUM	0.5	UG/L	U	W92-16A	Total	0.7
104234	Water	6-Mar-06	CHROMIUM	0.5	UG/L	U	W92-16A	Total	0.7
244304	Water	14-Jun-06	CHROMIUM	1.1	UG/L		W92-16A	Total	2
394200	Water	26-Sep-06	CHROMIUM	2.1	UG/L		W92-16A	Total	4
494085	Water	2-Dec-06	CHROMIUM	5	UG/L	U	W92-16A	Total	0.1



### Well W92-16B

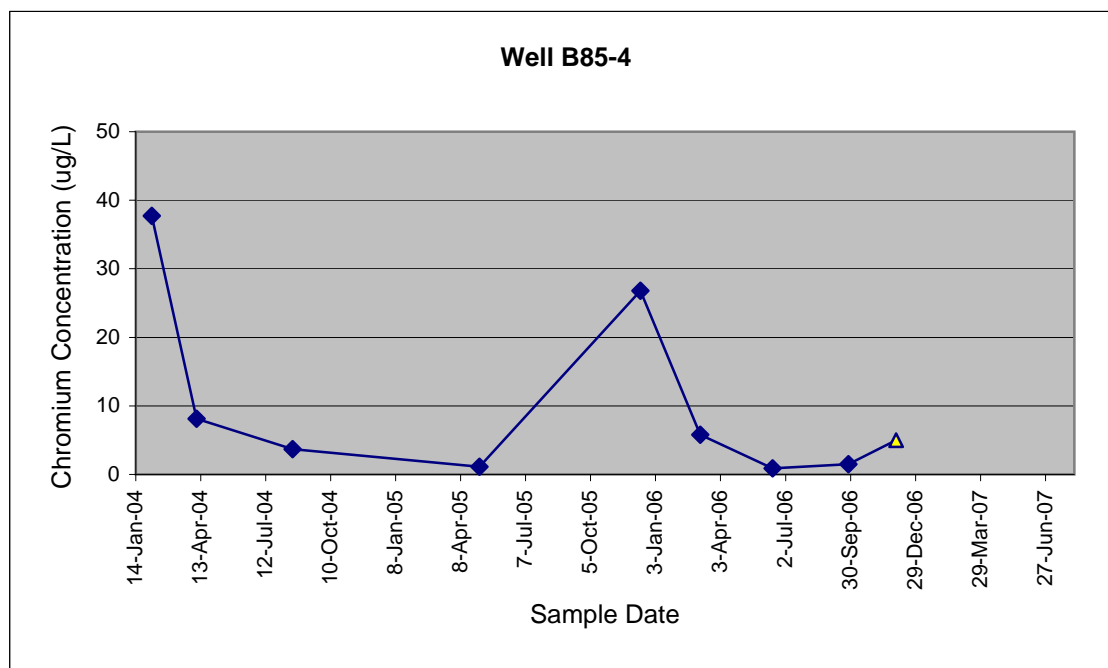
Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AH3	Water	05-Feb-04	CHROMIUM	2.6	UG/L	J	W92-16B	Total	7
MJ2BJ8	Water	7-Apr-04	CHROMIUM	1.3	UG/L	U	W92-16B	Total	2
MJ4735	Water	18-Aug-04	CHROMIUM	0.79	UG/L	J	W92-16B	Total	<10
184233	Water	3-May-05	CHROMIUM	0.68	UG/L		W92-16B	Total	3.9
05504312	Water	14-Dec-05	CHROMIUM	3.1	UG/L		W92-16B	Total	5.1
104233	Water	6-Mar-06	CHROMIUM	1	UG/L		W92-16B	Total	8.7
244305	Water	14-Jun-06	CHROMIUM	3.7	UG/L		W92-16B	Total	7
394201	Water	26-Sep-06	CHROMIUM	1.6	UG/L		W92-16B	Total	0.7
494086	Water	2-Dec-06	CHROMIUM	5	UG/L	U	W92-16B	Total	1





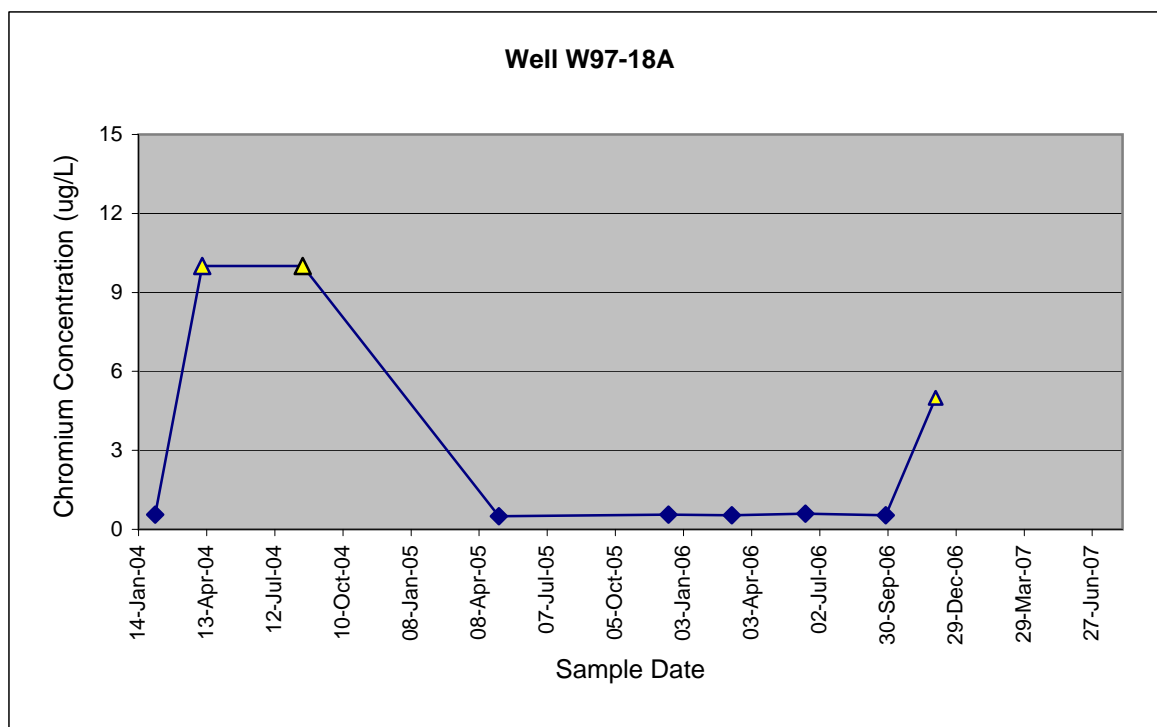
### Well B85-4

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AH4	Water	05-Feb-04	CHROMIUM	37.7	UG/L		B85-4	Total	1
MJ2BK1	Water	7-Apr-04	CHROMIUM	8.1	UG/L	J	B85-4	Total	0
MJ4738	Water	18-Aug-04	CHROMIUM	3.7	UG/L	J	B85-4	Total	4
184246	Water	4-May-05	CHROMIUM	1.1	UG/L		B85-4	Total	2
05504296	Water	13-Dec-05	CHROMIUM	26.8	UG/L		B85-4	Total	5.7
104237	Water	6-Mar-06	CHROMIUM	5.8	UG/L		B85-4	Total	3.9
244310	Water	14-Jun-06	CHROMIUM	0.9	UG/L		B85-4	Total	0.3
394207	Water	27-Sep-06	CHROMIUM	1.5	UG/L		B85-4	Total	1
494084	Water	2-Dec-06	CHROMIUM	5	UG/L	U	B85-4	Total	0



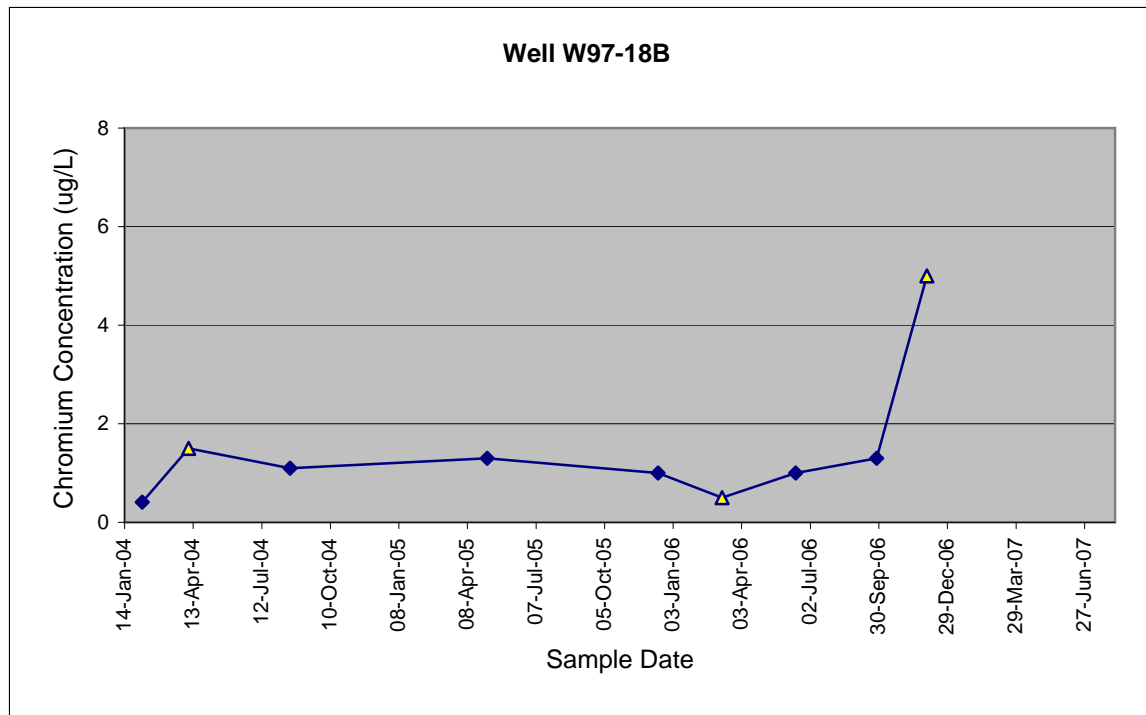
### Well W97-18A

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AH5	Water	05-Feb-04	CHROMIUM	0.56	UG/L	J	W97-18A	Total	14
MJ2BK2	Water	7-Apr-04	CHROMIUM	10	UG/L	U	W97-18A	Total	0
MJ4739	Water	18-Aug-04	CHROMIUM	10	UG/L	U	W97-18A	Total	5
184244	Water	4-May-05	CHROMIUM	0.5	UG/L		W97-18A	Total	1
05504300	Water	14-Dec-05	CHROMIUM	0.56	UG/L		W97-18A	Total	4
104256	Water	8-Mar-06	CHROMIUM	0.53	UG/L		W97-18A	Total	0
244298	Water	13-Jun-06	CHROMIUM	0.6	UG/L		W97-18A	Total	9
394209	Water	27-Sep-06	CHROMIUM	0.53	UG/L		W97-18A	Total	6
494080	Water	2-Dec-06	CHROMIUM	5	UG/L	U	W97-18A	Total	1



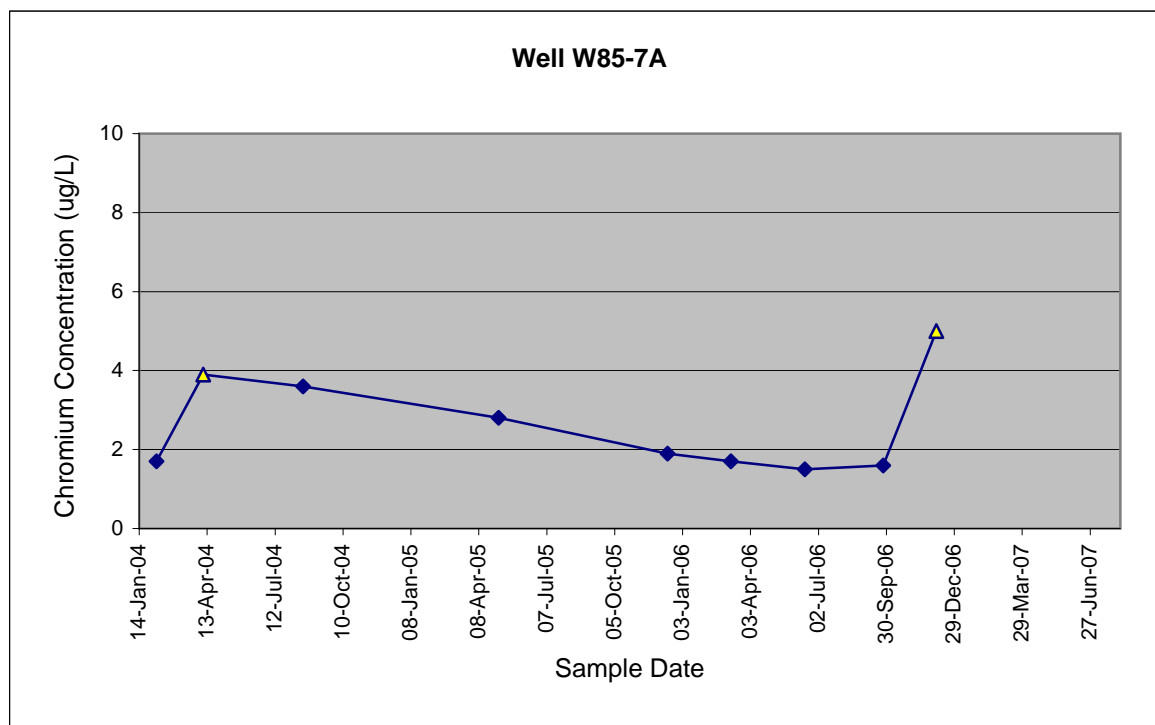
### Well W97-18B

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AH7	Water	06-Feb-04	CHROMIUM	0.41	UG/L	J	W97-18B	Total	2
MJ2BK3	Water	7-Apr-04	CHROMIUM	1.5	UG/L	U	W97-18B	Total	0
MJ4740	Water	18-Aug-04	CHROMIUM	1.1	UG/L	J	W97-18B	Total	5
184245	Water	4-May-05	CHROMIUM	1.3	UG/L		W97-18B	Total	1.1
05504301	Water	14-Dec-05	CHROMIUM	1	UG/L		W97-18B	Total	1.1
104257	Water	8-Mar-06	CHROMIUM	0.5	UG/L	U	W97-18B	Total	1.4
244299	Water	13-Jun-06	CHROMIUM	1	UG/L		W97-18B	Total	6
394208	Water	27-Sep-06	CHROMIUM	1.3	UG/L		W97-18B	Total	3
494081	Water	2-Dec-06	CHROMIUM	5	UG/L	U	W97-18B	Total	0.2



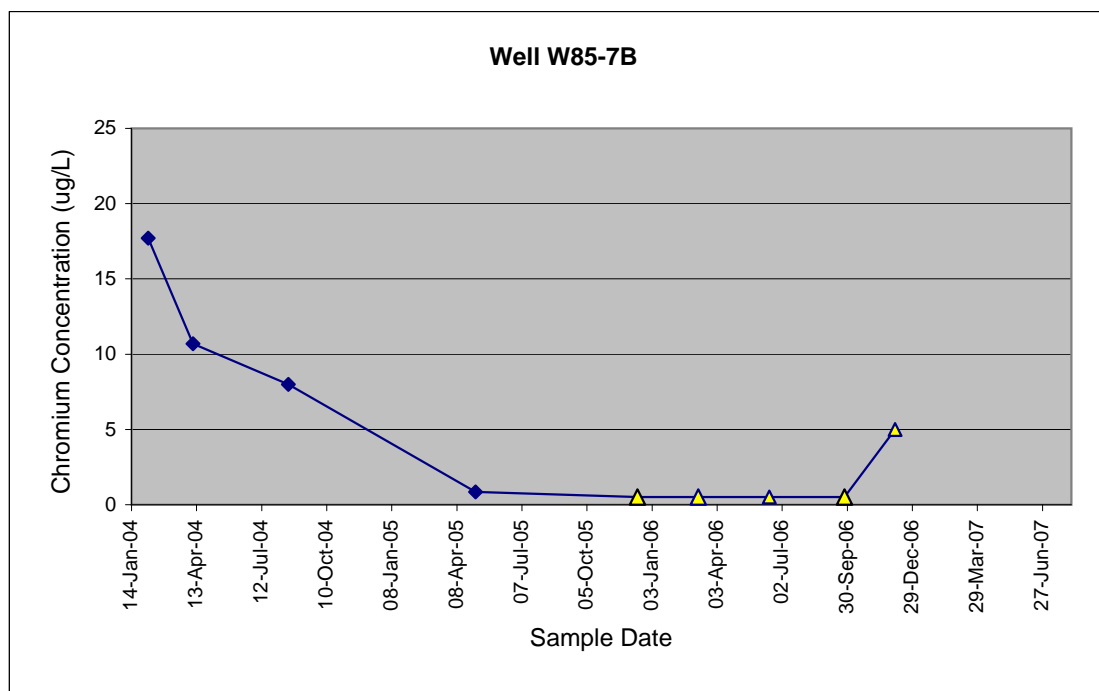
### Well W85-7A

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AH8	Water	06-Feb-04	CHROMIUM	1.7	UG/L	J	W85-7A	Total	1
MJ2BK6	Water	8-Apr-04	CHROMIUM	3.9	UG/L	U	W85-7A	Total	0
MJ4741	Water	18-Aug-04	CHROMIUM	3.6	UG/L	J	W85-7A	Total	3
184239	Water	4-May-05	CHROMIUM	2.8	UG/L		W85-7A	Total	0.5
05504307	Water	14-Dec-05	CHROMIUM	1.9	UG/L		W85-7A	Total	0.2
104254	Water	8-Mar-06	CHROMIUM	1.7	UG/L		W85-7A	Total	0
244306	Water	14-Jun-06	CHROMIUM	1.5	UG/L		W85-7A	Total	0.2
394202	Water	26-Sep-06	CHROMIUM	1.6	UG/L		W85-7A	Total	0.1
494112	Water	5-Dec-06	CHROMIUM	5	UG/L	U	W85-7A	Total	0.8



### Well W85-7B

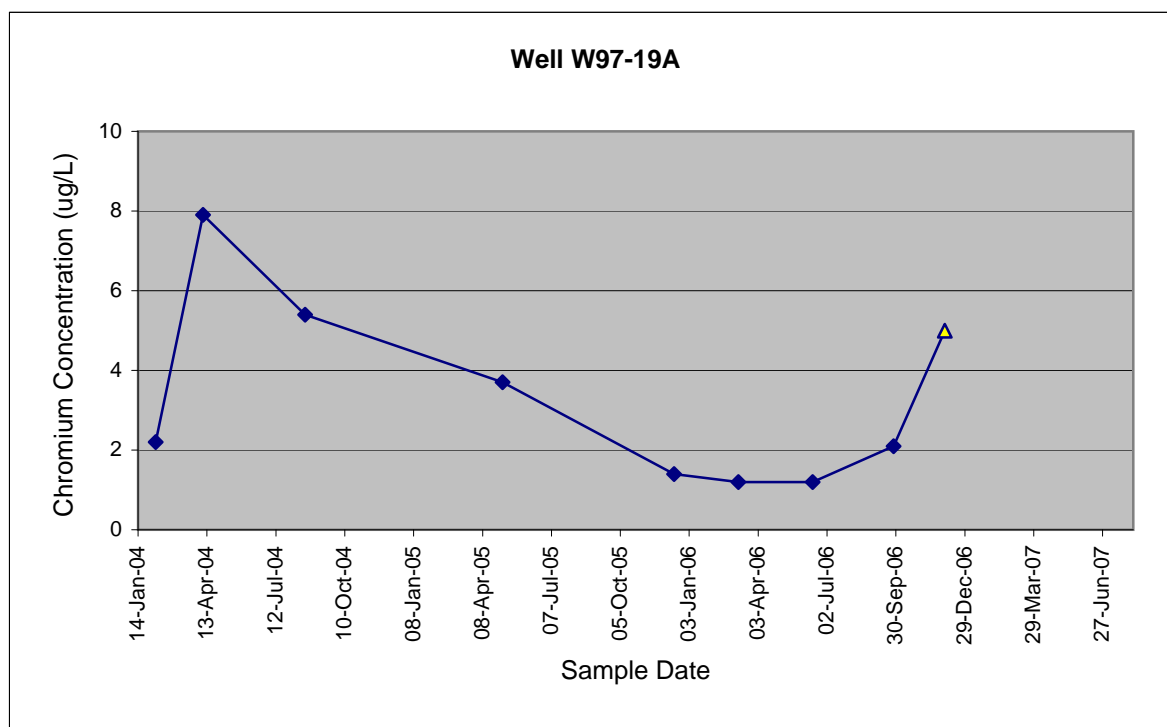
Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AH9	Water	06-Feb-04	CHROMIUM	17.7	UG/L		W85-7B	Total	3
MJ2BK7	Water	8-Apr-04	CHROMIUM	10.7	UG/L		W85-7B	Total	0
MJ4742	Water	18-Aug-04	CHROMIUM	8	UG/L	J	W85-7B	Total	25
184240	Water	4-May-05	CHROMIUM	0.84	UG/L		W85-7B	Total	6.7
05504308	Water	14-Dec-05	CHROMIUM	0.5	UG/L	U	W85-7B	Total	1.4
104255	Water	8-Mar-06	CHROMIUM	0.5	UG/L	U	W85-7B	Total	0
244307	Water	14-Jun-06	CHROMIUM	0.5	UG/L	U	W85-7B	Total	0.7
394203	Water	26-Sep-06	CHROMIUM	0.5	UG/L	U	W85-7B	Total	0.8
494111	Water	5-Dec-06	CHROMIUM	5	UG/L	U	W85-7B	Total	0.3



Note: Although turbidity was greater than 10 NTU, no filtered sample was collected.

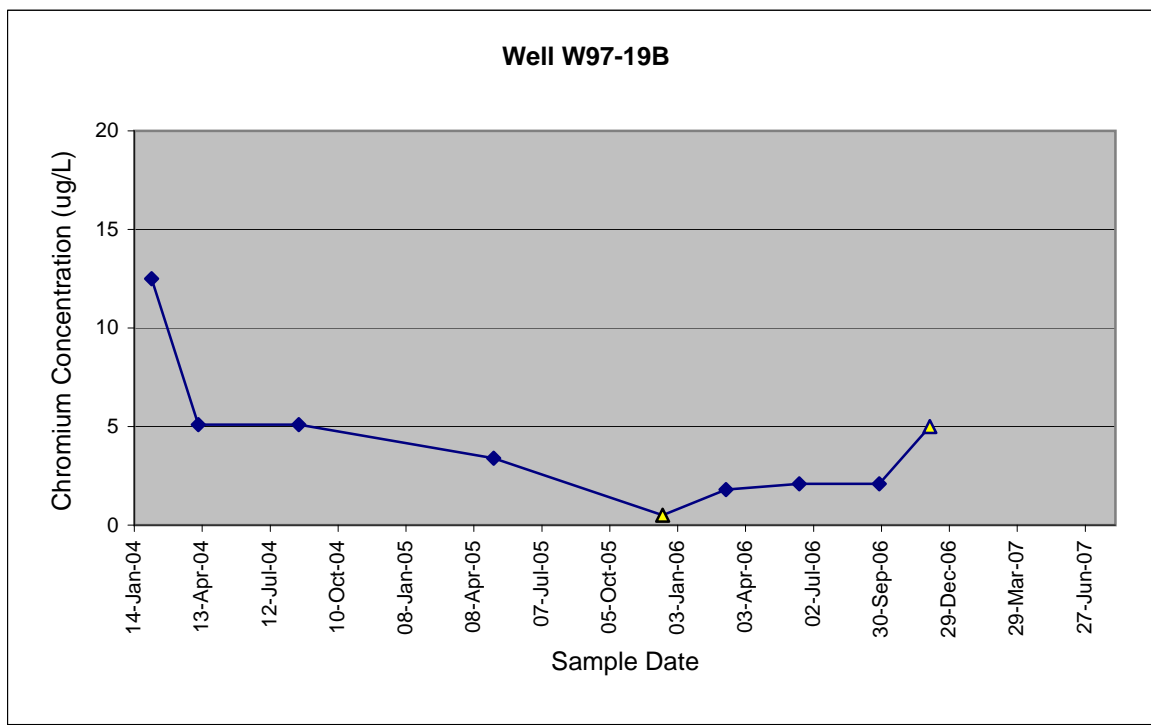
### Well W97-19A

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AJ0	Water	06-Feb-04	CHROMIUM	2.2	UG/L	J	W97-19A	Total	7
MJ2BK4	Water	8-Apr-04	CHROMIUM	7.9	UG/L	J	W97-19A	Total	2
MJ4749	Water	19-Aug-04	CHROMIUM	5.4	UG/L	J	W97-19A	Total	8
184242	Water	4-May-05	CHROMIUM	3.7	UG/L		W97-19A	Total	1.8
05504303	Water	14-Dec-05	CHROMIUM	1.4	UG/L		W97-19A	Total	0
104259	Water	8-Mar-06	CHROMIUM	1.2	UG/L		W97-19A	Total	1
244296	Water	13-Jun-06	CHROMIUM	1.2	UG/L		W97-19A	Total	1
394211	Water	27-Sep-06	CHROMIUM	2.1	UG/L		W97-19A	Total	0.4
494095	Water	3-Dec-06	CHROMIUM	5	UG/L	U	W97-19A	Total	1



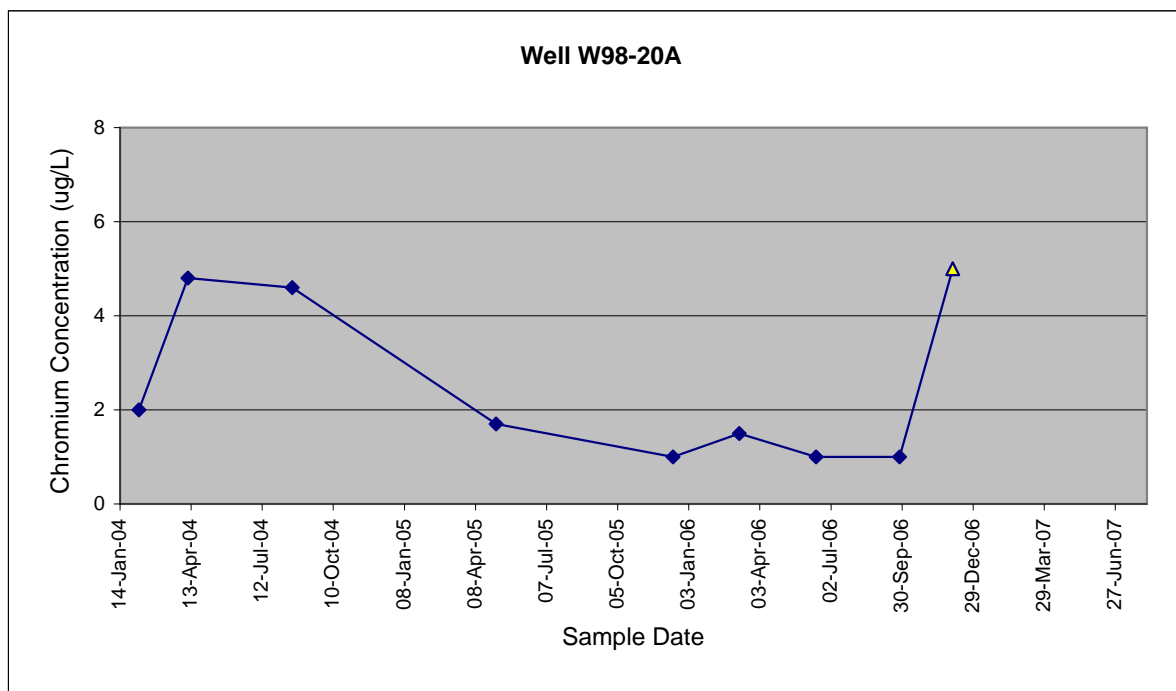
### Well W97-19B

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AJ1	Water	06-Feb-04	CHROMIUM	12.5	UG/L	J	W97-19B	Total	0
MJ2BK5	Water	8-Apr-04	CHROMIUM	5.1	UG/L	J	W97-19B	Total	1
MJ4750	Water	19-Aug-04	CHROMIUM	5.1	UG/L	J	W97-19B	Total	3
184243	Water	4-May-05	CHROMIUM	3.4	UG/L		W97-19B	Total	1
05504304	Water	14-Dec-05	CHROMIUM	0.5	UG/L	U	W97-19B	Total	0
104260	Water	8-Mar-06	CHROMIUM	1.8	UG/L		W97-19B	Total	5
244297	Water	13-Jun-06	CHROMIUM	2.1	UG/L		W97-19B	Total	0.5
394212	Water	27-Sep-06	CHROMIUM	2.1	UG/L		W97-19B	Total	1
494096	Water	3-Dec-06	CHROMIUM	5	UG/L	U	W97-19B	Total	1



### Well W98-20A

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AJ2	Water	07-Feb-04	CHROMIUM	2	UG/L	J	W98-20A	Total	1
MJ2BL2	Water	9-Apr-04	CHROMIUM	4.8	UG/L	J	W98-20A	Total	0
MJ4752	Water	19-Aug-04	CHROMIUM	4.6	UG/L	J	W98-20A	Dissolved	20
184241	Water	4-May-05	CHROMIUM	1.7	UG/L		W98-20A	Total	0.5
05504302	Water	14-Dec-05	CHROMIUM	1	UG/L		W98-20A	Total	0
104258	Water	8-Mar-06	CHROMIUM	1.5	UG/L		W98-20A	Total	0
244300	Water	13-Jun-06	CHROMIUM	1	UG/L		W98-20A	Total	0.4
394210	Water	27-Sep-06	CHROMIUM	1	UG/L		W98-20A	Total	0.1
494097	Water	3-Dec-06	CHROMIUM	5	UG/L	U	W98-20A	Total	0.3

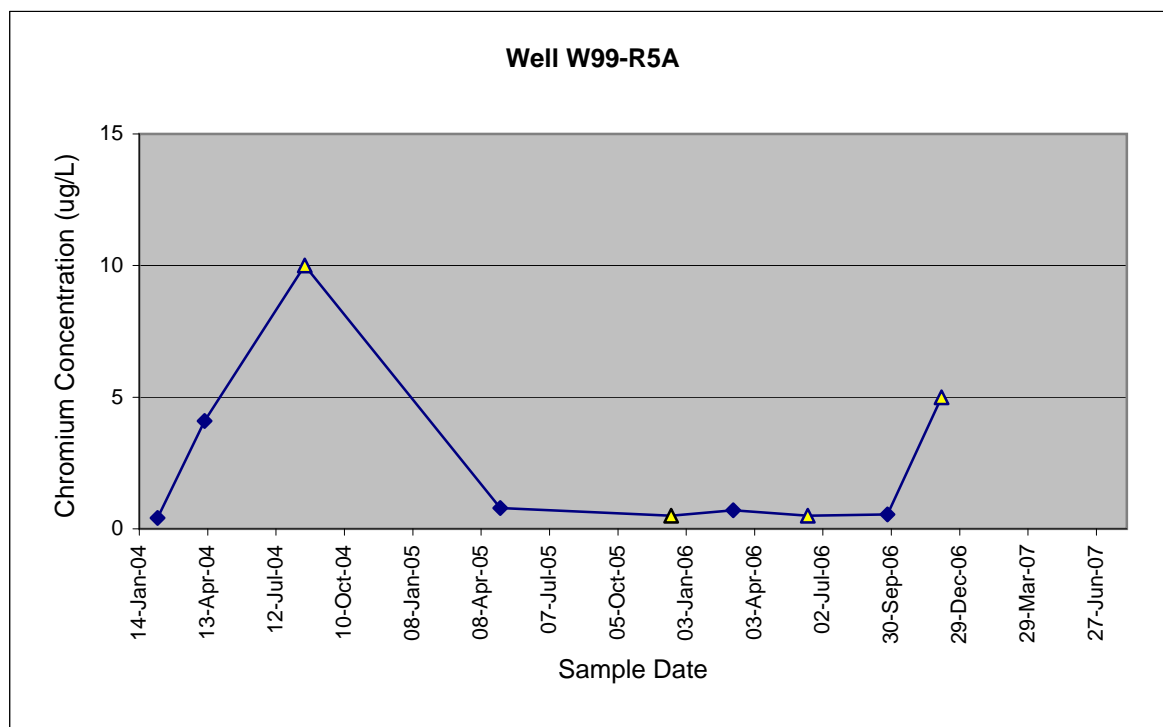


Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.



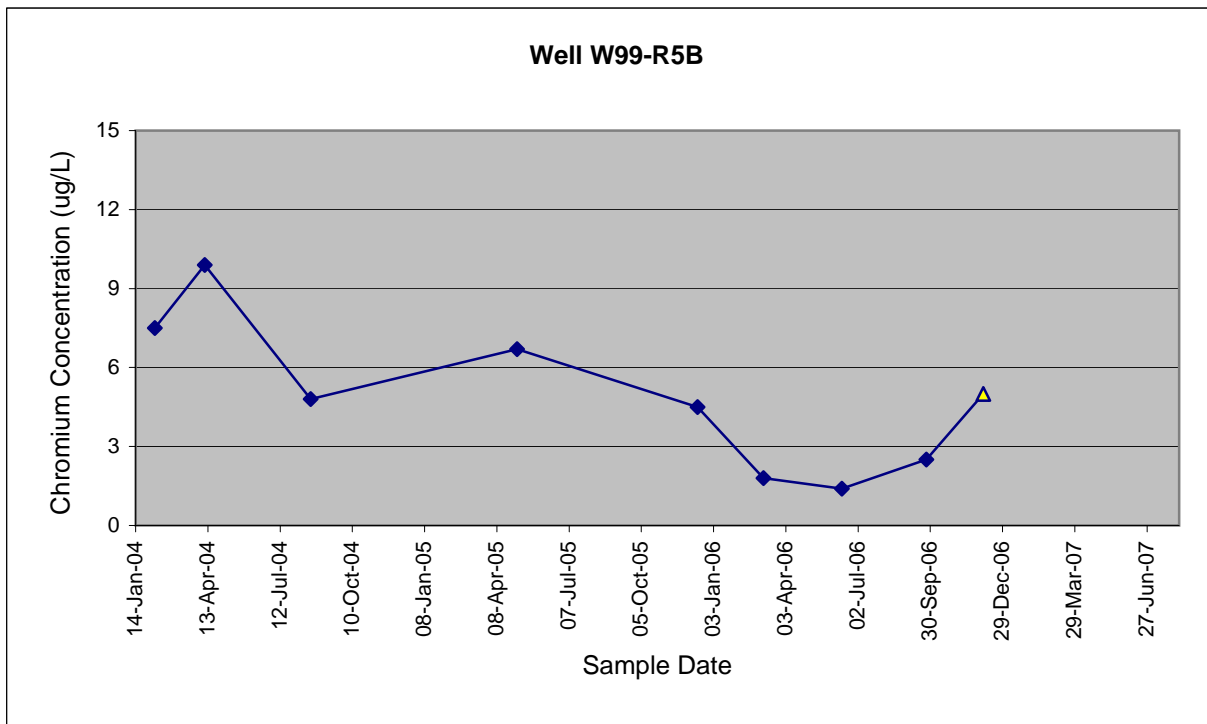
### Well W99-R5A

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AJ3	Water	07-Feb-04	CHROMIUM	0.41	UG/L	J	W99-R5A	Total	0
MJ2BL3	Water	9-Apr-04	CHROMIUM	4.1	UG/L	J	W99-R5A	Total	0
MJ4745	Water	19-Aug-04	CHROMIUM	10	UG/L	U	W99-R5A	Total	10
184230	Water	3-May-05	CHROMIUM	0.79	UG/L		W99-R5A	Total	1
05504305	Water	14-Dec-05	CHROMIUM	0.5	UG/L	U	W99-R5A	Total	0
104230	Water	6-Mar-06	CHROMIUM	0.7	UG/L		W99-R5A	Total	0
244280	Water	12-Jun-06	CHROMIUM	0.5	UG/L	U	W99-R5A	Total	1
394180	Water	25-Sep-06	CHROMIUM	0.55	UG/L		W99-R5A	Total	1
494115	Water	5-Dec-06	CHROMIUM	5	UG/L	U	W99-R5A	Total	1



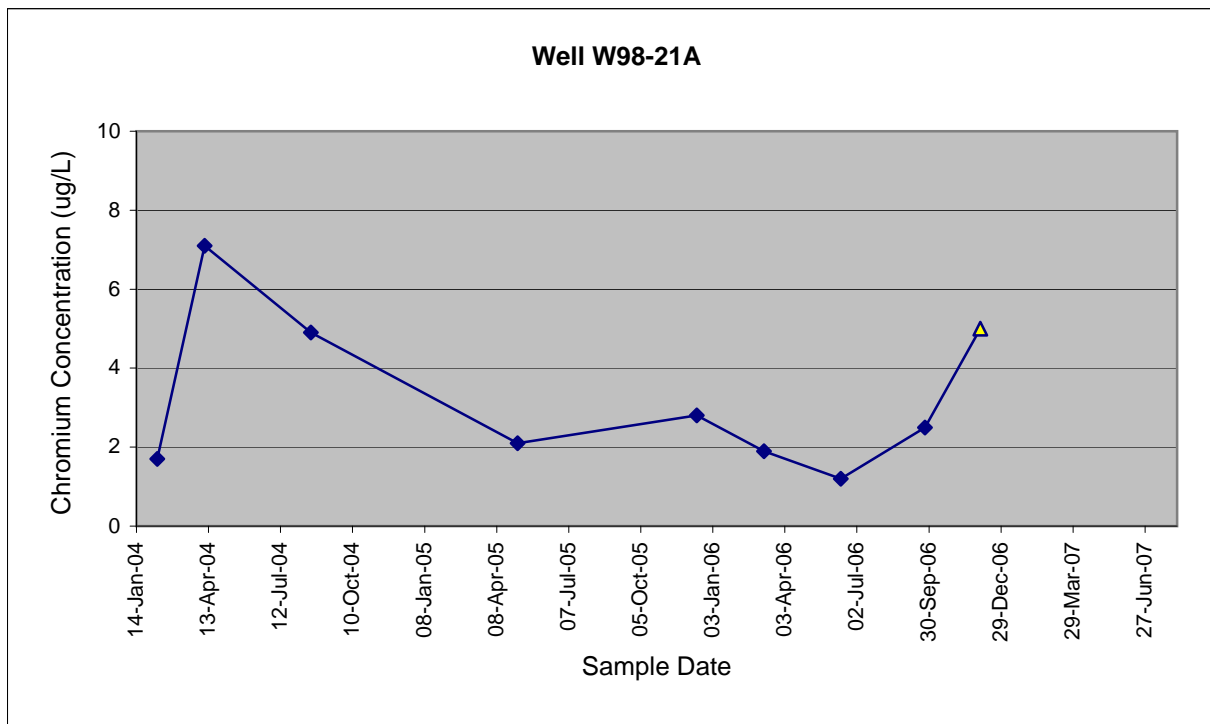
### Well W99-R5B

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AJ5	Water	07-Feb-04	CHROMIUM	7.5	UG/L	J	W99-R5B	Total	0
MJ2BL4	Water	9-Apr-04	CHROMIUM	9.9	UG/L	J	W99-R5B	Total	0
MJ4746	Water	19-Aug-04	CHROMIUM	4.8	UG/L	J	W99-R5B	Total	8
184231	Water	3-May-05	CHROMIUM	6.7	UG/L		W99-R5B	Total	2.3
05504306	Water	14-Dec-05	CHROMIUM	4.5	UG/L		W99-R5B	Total	2.1
104231	Water	6-Mar-06	CHROMIUM	1.8	UG/L		W99-R5B	Total	0
244281	Water	12-Jun-06	CHROMIUM	1.4	UG/L		W99-R5B	Total	3
394181	Water	25-Sep-06	CHROMIUM	2.5	UG/L		W99-R5B	Total	1
494116	Water	5-Dec-06	CHROMIUM	5	UG/L	U	W99-R5B	Total	1



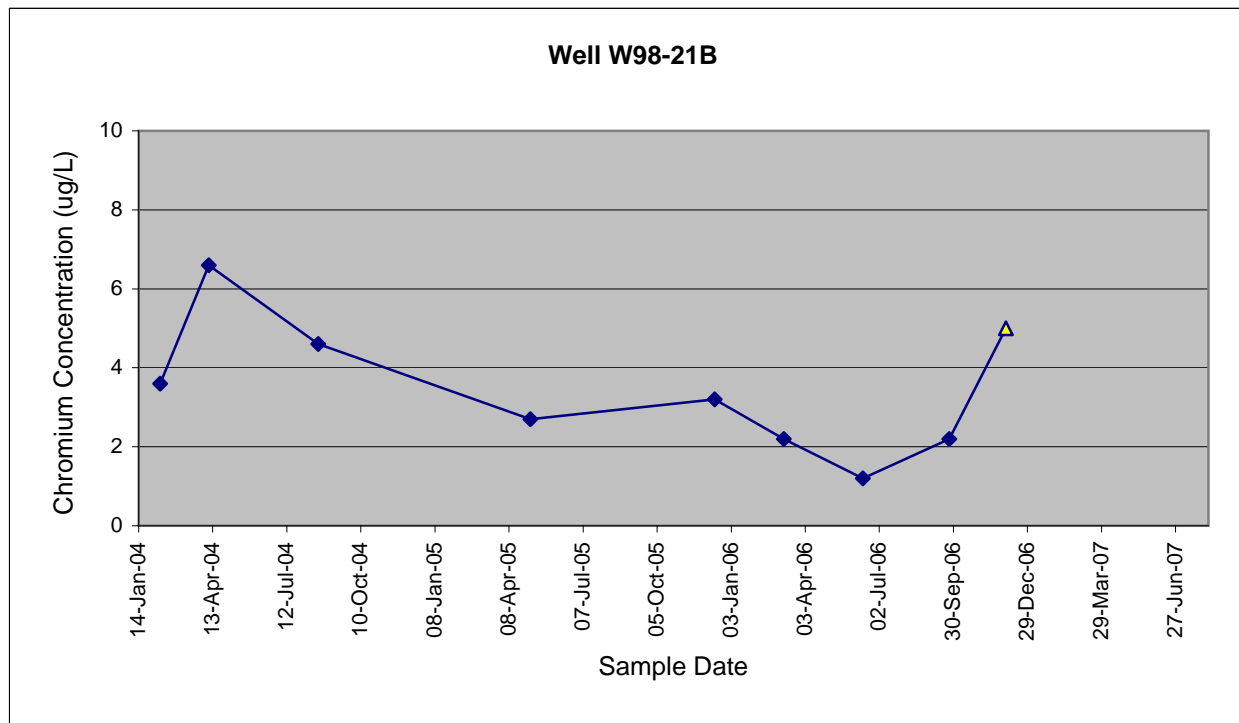
### Well W98-21A

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AJ6	Water	09-Feb-04	CHROMIUM	1.7	UG/L	J	W98-21A	Total	No Data
MJ2BK8	Water	8-Apr-04	CHROMIUM	7.1	UG/L	J	W98-21A	Total	0
MJ4743	Water	19-Aug-04	CHROMIUM	4.9	UG/L	J	W98-21A	Total	0
184237	Water	4-May-05	CHROMIUM	2.1	UG/L		W98-21A	Total	1.3
05504309	Water	14-Dec-05	CHROMIUM	2.8	UG/L		W98-21A	Total	0.1
104261	Water	8-Mar-06	CHROMIUM	1.9	UG/L		W98-21A	Total	0
244282	Water	12-Jun-06	CHROMIUM	1.2	UG/L		W98-21A	Total	0.3
394185	Water	25-Sep-06	CHROMIUM	2.5	UG/L		W98-21A	Total	0.2
494098	Water	3-Dec-06	CHROMIUM	5	UG/L	U	W98-21A	Total	0.1



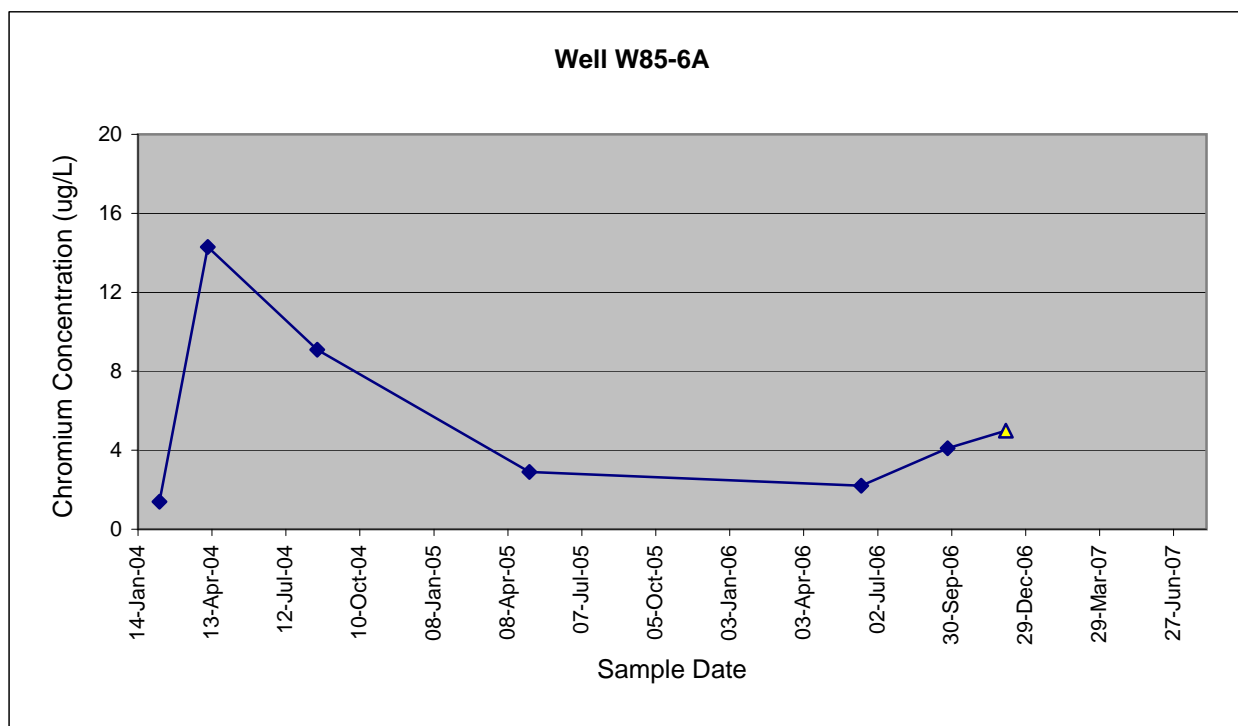
### Well W98-21B

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AJ7	Water	09-Feb-04	CHROMIUM	3.6	UG/L	J	W98-21B	Total	No Data
MJ2BK9	Water	8-Apr-04	CHROMIUM	6.6	UG/L	J	W98-21B	Total	0
MJ4744	Water	19-Aug-04	CHROMIUM	4.6	UG/L	J	W98-21B	Total	5
184238	Water	4-May-05	CHROMIUM	2.7	UG/L		W98-21B	Total	0.5
05504310	Water	14-Dec-05	CHROMIUM	3.2	UG/L		W98-21B	Total	0
104262	Water	8-Mar-06	CHROMIUM	2.2	UG/L		W98-21B	Total	0
244283	Water	12-Jun-06	CHROMIUM	1.2	UG/L		W98-21B	Total	0.3
394186	Water	25-Sep-06	CHROMIUM	2.2	UG/L		W98-21B	Total	0.1
494099	Water	3-Dec-06	CHROMIUM	5	UG/L	U	W98-21B	Total	0.2



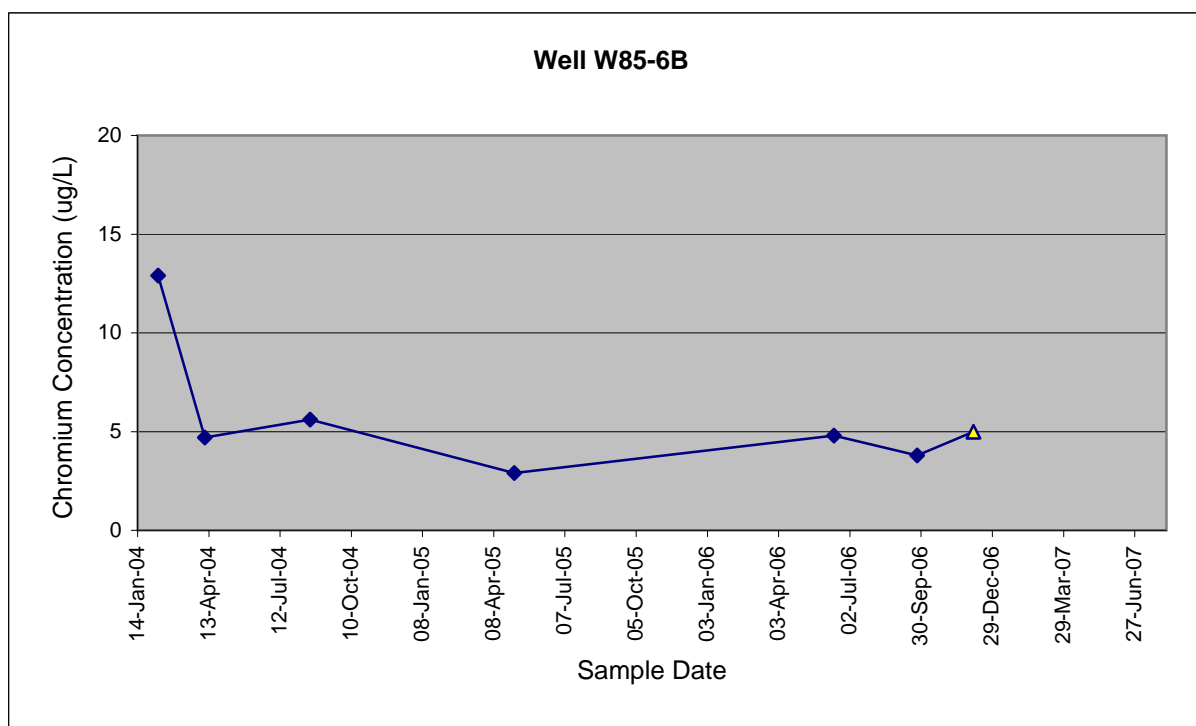
# Well W85-6A

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AJ8	Water	09-Feb-04	CHROMIUM	1.4	UG/L	J	W85-6A	Total	No Data
MJ2BL0	Water	8-Apr-04	CHROMIUM	14.3	UG/L		W85-6A	Total	0
MJ4747	Water	19-Aug-04	CHROMIUM	9.1	UG/L	J	W85-6A	Total	<10
184235	Water	4-May-05	CHROMIUM	2.9	UG/L		W85-6A	Total	1
244284	Water	12-Jun-06	CHROMIUM	2.2	UG/L		W85-6A	Total	0.7
394182	Water	25-Sep-06	CHROMIUM	4.1	UG/L		W85-6A	Total	0.1
494113	Water	5-Dec-06	CHROMIUM	5	UG/L	U	W85-6A	Total	2



### Well W85-6B

Sample No.	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AJ9	Water	09-Feb-04	CHROMIUM	12.9	UG/L		W85-6B	Total	No Data
MJ2BL1	Water	8-Apr-04	CHROMIUM	4.7	UG/L	J	W85-6B	Total	0
MJ4748	Water	19-Aug-04	CHROMIUM	5.6	UG/L	J	W85-6B	Total	5
184236	Water	4-May-05	CHROMIUM	2.9	UG/L		W85-6B	Total	1
244286	Water	12-Jun-06	CHROMIUM	4.8	UG/L		W85-6B	Total	49
394183	Water	25-Sep-06	CHROMIUM	3.8	UG/L		W85-6B	Total	14
494114	Water	5-Dec-06	CHROMIUM	5	UG/L	U	W85-6B	Total	9



**APPENDIX B**

**LABORATORY DATA SHEETS**

**Manchester Environmental Laboratory**  
7411 Beach Dr E, Port Orchard, Washington 98366

**Case Narrative**

**January 8, 2007**

**Subject:** Metals Frontier Hardchrome - 49

**Project No:** 191306

**Officer:** Guy Barrett

**By:** Dean Momohara

**Summary**

The samples were analyzed and/or digested using the following methods: EPA method 200.7 for the digestion and analysis of minerals and EPA method 200.8 (ICPMS) for the digestion and analysis of trace metals.

All analyses requested were evaluated by established regulatory quality assurance guidelines.

**Sample Information**

Samples were received by Manchester Environmental Laboratory on 12/06/06. All coolers were received within the proper temperature range of 0°C - 6°C. The samples were received in good condition and were properly preserved. Thirty eight (38) samples were received and assigned laboratory identification numbers 494080 – 494117

**Holding Times**

All analyses were performed within established EPA holding times.

**Calibration**

Instrument calibrations and calibration checks were performed in accordance with the appropriate method. Except for a couple of exceptions, all initial and continuing calibration checks were within control limits.



One of the associated continuing calibration blanks (CCBs) for total arsenic for samples 494100 and 494102 was greater than the acceptance limit. The absolute value of one of the associated CCBs for total vanadium for samples 494107 – 494109 and 494114 was greater than the acceptance limit. The associated continuing calibration checks for dissolved silver failed due to matrix interference. All results were qualified as estimates.

ICPMS calibration correlation coefficients were within the acceptance range of 1.000 - 0.995. The instruments were calibrated with NIST traceable standards and verified to be in calibration with a second source NIST traceable standard.

### **Method Blanks**

The absolute values of the method blanks (MB) associated with samples 494080 – 494088, 494090, 494091 and 494094 - 494102 for total selenium and with samples 494106, 494113, 494114 and 494116 for total vanadium were greater than the acceptance limit. The results were qualified as estimates. No other analytically significant levels of analyte were detected in the method blanks associated with these samples.

### **Matrix Spikes**

The matrix spike (MS) recoveries for total sodium, calcium and potassium for sample 494117 were not calculated. The standard spiking level was insufficient for the elevated concentration of analyte in the source sample and no action was taken. One of the MS recoveries for dissolved silver for sample 494093 was less than the lower acceptance limit. The source sample was qualified as an estimate. All other MS recoveries were within the acceptance limits of 75% - 125%.

### **Replicates**

All duplicate relative percent differences of samples with concentrations greater than 5 times the reporting limit were within the acceptance range of 0% - 20%.

### **Laboratory Control Samples**

All laboratory control sample recoveries were within the acceptance limits of 85% - 115%.

### **Other Quality Assurance Measures and Issues**

All internal standard recoveries were within acceptance limits.

All samples for trace metals were diluted by a factor of 10 and samples 494102 and 494106 – 494110 for minerals were diluted by a factor of 5 prior to analysis due to matrix interference. The reporting limits were raised accordingly.

The results for total and dissolved aluminum were qualified as estimates. The samples contained matrix interference that caused the background to be elevated in each sample.

- U - The analyte was not detected at or above the reported result.
- UJ - The analyte was not detected at or above the reported estimated result.
- J - The analyte was positively identified. The associated numerical result is an estimate.
- NC - Not Calculated
- bold** - The analyte was present in the sample. (Visual Aid to locate detected compounds on report sheet.)

Please call Dean Momohara at (360) 871-8808 to further discuss this project.

cc: Project File

**Washington State Department of Ecology**  
**Manchester Environmental Laboratory**  
**Analysis Report for**  
**Chromium**

**Project Name:** Frontier Hardchrome - 49

**LIMS Project ID:** 1913-06

**Project Officer:** Guy Barrett

**Method:** EPA200.8

**Date Reported:** 01/08/07

**Analyte:** Chromium

Sample	QC	Field ID	Matrix	Result	Qualifier	Units	Collected	Analyzed
06494080		W97-18A	Water	5.0	U	ug/L	12/02/06	12/14/06
06494080		LMX1 (matrix spike)		102		%	12/02/06	12/14/06
06494080		LMX2 (matrix spike)		99		%	12/02/06	12/14/06
06494081		W97-18B	Water	5.0	U	ug/L	12/02/06	12/14/06
06494082		B87-8	Water	31		ug/L	12/02/06	12/14/06
06494083		---	Water	33		ug/L	12/02/06	12/14/06
06494084		B85-4	Water	5.0	U	ug/L	12/02/06	12/14/06
06494085		W92-16A	Water	5.0	U	ug/L	12/02/06	12/14/06
06494086		W92-16B	Water	5.0	U	ug/L	12/02/06	12/14/06
06494087		RAMW-16A	Water	5.0	U	ug/L	12/02/06	12/14/06
06494088		RA-MW-16B	Water	16		ug/L	12/02/06	12/14/06
06494090		RA-MW-15A	Water	5.0	U	ug/L	12/02/06	12/14/06
06494091		RA-MW-15B	Water	21		ug/L	12/02/06	12/14/06
06494094		B85-3	Water	5.0	U	ug/L	12/03/06	12/14/06
06494095		W97-19A	Water	5.0	U	ug/L	12/03/06	12/14/06
06494096		W97-19B	Water	5.0	U	ug/L	12/03/06	12/14/06
06494097		W98-20A	Water	5.0	U	ug/L	12/03/06	12/14/06
06494098		W98-21A	Water	5.0	U	ug/L	12/03/06	12/14/06
06494099		W98-21B	Water	5.0	U	ug/L	12/03/06	12/14/06
06494100		RA-MW-14A	Water	5.0	U	ug/L	12/03/06	12/14/06
06494101		RA-MW-14B	Water	5.0	U	ug/L	12/03/06	12/14/06
06494102		RA-MW-13A	Water	5.0	U	ug/L	12/04/06	12/14/06
MB06341I1		Lab BLNK	Water	5.0	U	ug/L		12/14/06
ML06341I1		Lab LCS-	Water	104		%		12/14/06

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JAN 20 2007

Authorized By: M. Jones

Release Date: 1/8/07

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**Washington State Department of Ecology**  
**Manchester Environmental Laboratory**  
**Analysis Report for**  
**Chromium**

**Project Name: Frontier Hardchrome - 49**

**LIMS Project ID: 1913-06**

**Project Officer: Guy Barrett**

**Method: EPA200.8**

**Date Reported: 01/05/07**

**Analyte: Chromium**

Sample	QC	Field ID	Matrix	Result	Qualifier	Units	Collected	Analyzed
06494103		RA-MW-13B	Water	5.0	U	ug/L	12/04/06	12/22/06
06494104		RA-MW-13C	Water	5.0	U	ug/L	12/04/06	12/22/06
06494105		RA-MW-17A	Water	5.0	U	ug/L	12/04/06	12/22/06
06494106		RA-MW-11A	Water	5.0	U	ug/L	12/04/06	12/22/06
06494107		RA-MW-11B	Water	5.0	U	ug/L	12/04/06	12/22/06
06494108		RA-MW-12B	Water	5.0	U	ug/L	12/04/06	12/22/06
06494109		RA-MW-12A	Water	80.7		ug/L	12/04/06	12/22/06
06494111		W85-7B	Water	5.0	U	ug/L	12/05/06	12/22/06
06494112		W85-7A	Water	5.0	U	ug/L	12/05/06	12/22/06
06494113		W85-6A	Water	5.0	U	ug/L	12/05/06	12/22/06
06494114		W85-6B	Water	5.0	U	ug/L	12/05/06	12/22/06
06494115		W99-R5A	Water	5.0	U	ug/L	12/05/06	12/22/06
06494116		W99-R5B	Water	5.0	U	ug/L	12/05/06	12/22/06
06494117		RA-MW-12C	Water	5.1		ug/L	12/04/06	12/22/06
06494117		LMX1 (matrix spike)		90		%	12/04/06	12/22/06
06494117		LMX2 (matrix spike)		90		%	12/04/06	12/22/06
MB0634611		Lab BLNK	Water	5.0	U	ug/L		12/22/06
ML0634611		Lab LCS-	Water	96		%		12/22/06

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JAN 20 2007

Authorized By: M. Jansen

Release Date: 1/5/07

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**Washington State Department of Ecology**  
**Manchester Environmental Laboratory**  
**Analysis Report for**  
**Chromium, Dissolved**

**Project Name:** Frontier Hardchrome - 49

**LIMS Project ID:** 1913-06


**Project Officer:** Guy Barrett

**Method:** EPA200.8

**Date Reported:** 01/05/07

**Analyte:** Chromium

Sample	QC	Field ID	Matrix	Result	Qualifier	Units	Collected	Analyzed
06494089		RA-MW-16B	Field Filtered water	18		ug/L	12/02/06	01/05/07
06494092		RA-MW-15B	Field Filtered water	16		ug/L	12/02/06	01/05/07
06494093		---	Field Filtered water	17		ug/L	12/02/06	01/05/07
06494093	LMX1 (matrix spike)			102		%	12/02/06	01/05/07
06494093	LMX2 (matrix spike)			103		%	12/02/06	01/05/07
06494110		RA-MW-12A	Field Filtered water	6.8		ug/L	12/04/06	01/05/07
MB07005I1		Lab BLNK	Water	5.0	U	ug/L		01/05/07
ML07005I1		Lab LCS-	Water	104		%		01/05/07

  
JAN 20 2007

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Release Date: 1/5/07

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**APPENDIX C**  
**DATA VALIDATION MEMORANDUM**

## EXCEPTION SUMMARY FOR LABORATORY DATA QUALITY ASSURANCE REVIEW

### DATA SUMMARY

The laboratory data quality assurance review and validation of analytical results for 38 water samples, Project Number 1913-06, collected between 02 December 2006 and 05 December 2006 from the Frontier Hard Chrome site has been completed. This review incorporates sample results for other metals for assessment purposes, but applies only to the following analyses:

- Total recoverable and dissolved chromium by Washington State Department of Ecology's (WDOE) Manchester Environmental Laboratory (MEL), of Port Orchard, Washington, following EPA Method 200.8 – inductively-coupled plasma/mass spectrometry (IC/MS).

Quality assurance/quality control (QA/QC) reviews of laboratory procedures were performed on an ongoing basis by the laboratory. A data review was performed by the laboratory QA section on laboratory quality control results to ensure they met method quality objectives for the project. Data review followed the format outlined in the *National Functional Guidelines for Inorganic Data Review* (EPA 2004), modified to include specific criteria specified in the *Frontier Hard Chrome Long-Term Monitoring Plan* (Work Plan; Weston 2004). Raw laboratory data including calibrations, sample login forms, sample preparation logs and bench sheets, mass spectral tuning data, nor raw instrument data were not available for this review.

This is an exception summary. All laboratory quality assurance results as applicable (e.g., holding times; blank sample analysis, matrix spike/duplicate spike analysis, and laboratory control sample analysis results) supplied to Weston for the analyses met acceptance criteria specified in the Work Plan (Weston 2004), with no exceptions noted.

### DATA QUALIFICATION

No QA/QC exceptions were noted in the data review associated with the analysis of total recoverable and dissolved chromium. Upon consideration of the data qualifications noted above and the project data quality objectives specified in the QAPP, the data are ACCEPTABLE for use.

### DATA QUALIFIERS

**If required, any data qualifiers applied by the laboratory have been removed from the data summary sheets and superseded by data validation qualifiers.**

The following data validation qualifiers were used to modify the data quality and usefulness of individual analytical results.

U - The analyte was not detected at the given quantitation limit.

## **DATA ASSESSMENT**

Data review was performed by an experienced quality assurance chemist independent of the analytical laboratory and not directly involved in the project.

This is to certify that I have examined the analytical data and based on the information provided to me by the laboratory, in my professional judgment the data are acceptable for use except where qualified with qualifiers that modify the usefulness of those individual values.

original signed

R. Paul Swift, Ph.D., P.E.  
Chief Chemist

1-25-07

Date